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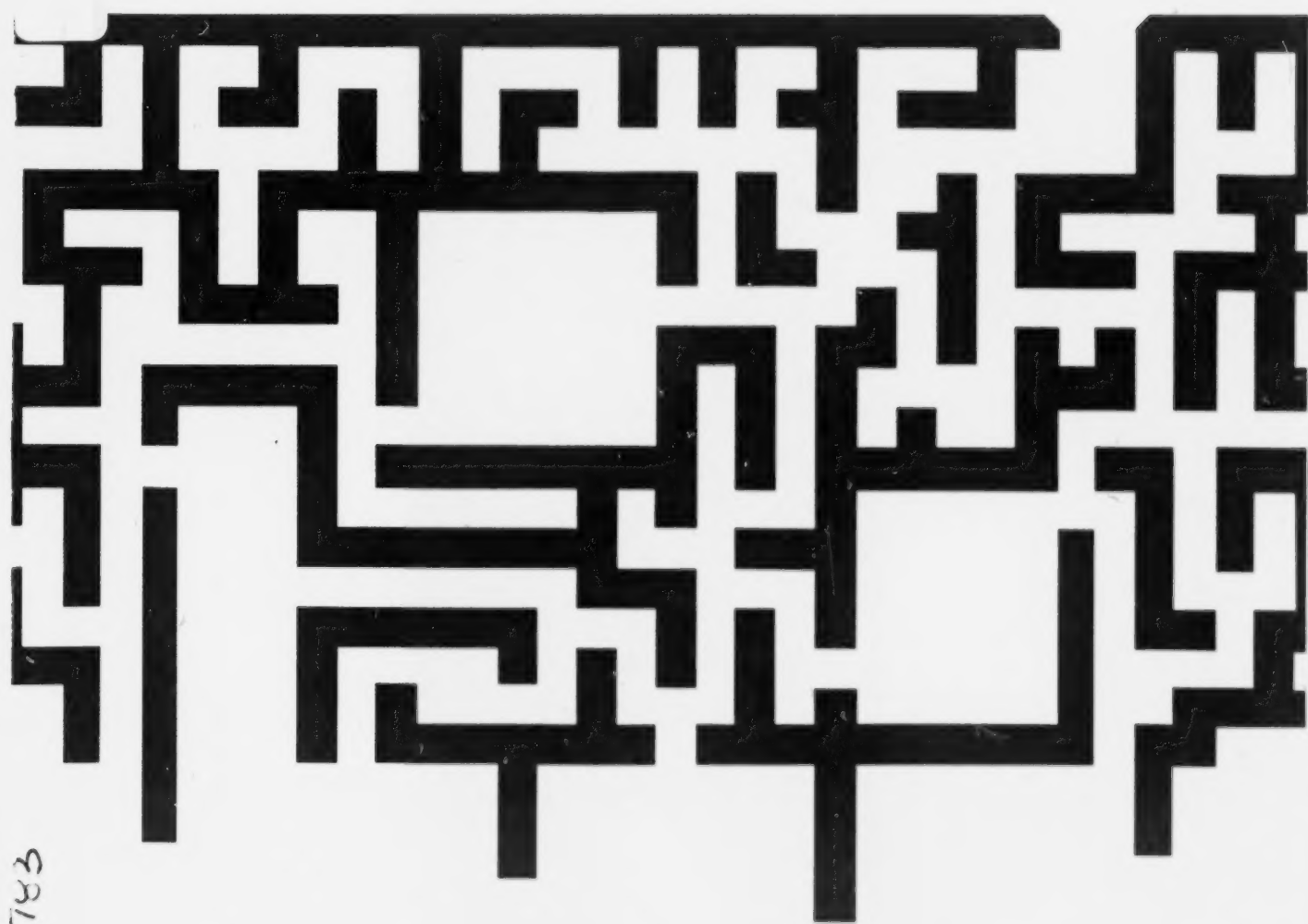
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ABSTRACT

As an overview of a 6-year federally funded state program, Project MINI-SCORE's final report is intended to provide guidance personnel in Minnesota with occupational data useful for counseling high school students. Over 17,500 applicants to the full-time day programs offered in 24 Minnesota Area Vocational-Technical Schools were tested with a battery of five standardized vocational, personality, and aptitude tests and a personal data sheet in order to determine significant individual differences among those who are accepted into these schools, begin related employment, and achieve successful vocational adjustment, and those who do not. From these data bases, three instruments proved most useful for predicting success for vocational students: (1) the Minnesota Vocational Interest Inventory, (2) the Sixteen Personality Factor Questionnaire, and (3) the Minnesota Importance Questionnaire. Other success criteria were inconsistent, although the existence of significant differences among male and female groups and those successful in different occupations was documented from pre-enrollment test data. Numerous tables present the data. Supplementing this document are five comprehensive explanations of all statistical analyses, previously announced as ED 064 521-ED 064 525 and titled "Project MINI-SCORE Final Technical Reports." (AG)



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PROJECT MINI-SCORE FINAL REPORT

by
Howard F. Nelson
Professor and Director
Division of Vocational and Technical Education
University of Minnesota
Principal Investigator

David J. Pucel
Associate Professor
Department of Industrial Education
University of Minnesota
Project Director

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Project MINI-SCORE
(Minnesota Student Characteristics and
Occupationally Related Education)
Department of Industrial Education
University of Minnesota
September, 1972

FOREWORD

This document constitutes the general final report of Project MINI-SCORE, supported by the U.S. Office of Education as Project No. HRD 5-0148, initially funded on November 1, 1965, and formally concluded on December 31, 1971.

The present report provides a general over-view of the entire Project from initiation to conclusion, with reports of significant findings, conclusions, and associated outcomes. Paralleling and supporting this document are five additional technical documents appropriately titled Project MINI-SCORE Final Technical Reports.

Thus, a reader who wants to gain a general description of the research may do so by reference to the present report; one who wishes to probe deeper into the differentiative or predictive power of the standardized tests used, the derivation and development of training success or employment success norms based upon these instruments would additionally read the applicable technical report. The Principal Investigator and the Project Director believed that this separation of content would increase the usefulness of both sets of documents.

Major responsibility for the present, general Final Report has been carried by the Principal Investigator; Final Technical Reports have been authored principally by David J. Pucel, Director of Project MINI-SCORE since its inception.

When Project MINI-SCORE was originally designed as a potential, fundable research effort, it carried another title than the present one. It seems appropriate in this foreword to clarify the four titles which have been associated with it. The original title which appeared on the Project when submitted to the U.S.O.E. read as follows:

"A Study of Basic Competencies and Characteristics Useful to the Process of Selecting and Admitting Student-Trainees to the Full-Time, Day Trade Courses Given in the Twenty-Four Area Vocational-Technical Schools in Minnesota"

While no publications appeared under the above title or under the first modification in it performed by the Business Office of the University, some financial reports may show the following shortened title:

"Characteristics of Full-Time Students in Post-Secondary Trade Schools"

Shortly thereafter, Project personnel adopted yet another version of the original title as follows:

"Area School Selection Project"

As the first batches of data began to accumulate in the office, and after the Principal Investigator and the Project Director became better acquainted with the research, it became patently evident that neither title was quite appropriate for the study. Neither researcher was especially interested in "selection" or "admission" to the day trade courses but rather both were philosophically oriented toward the derivation or gathering of information useful for counseling purposes by qualified guidance personnel.

Selection and admission suggested a negative philosophy calling for selection or rejection from a group of applicants based upon possession of specific amounts or degrees of pre-determined capabilities. The positive philosophy which was quickly adopted called for admitting students irrespective of estimated capabilities and then searching for the avenues of preparation in which they could find success and satisfaction. These developments brought about a serious discussion of the research's title and objectives and it was decided that a more appropriate title would be Project MINI-SCORE,

"Minnesota Student Characteristics and Occupationally Related Education."

Although the U.S.O.E. funding of Project MINI-SCORE terminated on December 31, 1971, the basic project did not really terminate and expire on that date. For about forty years, the University's Student Counseling Bureau has provided a testing, scoring and reporting service to Minnesota's schools. Under this provision, the State-Wide Testing Program has made available selected testing instruments such as the Minnesota Scholastic Aptitude Test battery, one of the major instruments employed in Project MINI-SCORE.

Upon becoming informed of this research project's objectives, the Bureau inaugurated an addition appropriately labeled the Vocational Testing Division. This area now provides several of the most useful instruments used in Project MINI-SCORE, making these tests and scores available to Minnesota's school guidance personnel. Guidance personnel may counsel high school juniors now and in the future employing the findings from this research. Therefore, Project MINI-SCORE did not expire and fade away on December 31, 1971, but will continue in Minnesota under the aegis of the University State-Wide Testing Service, Vocational Testing Program.

Complementing this development, all guidance personnel in Minnesota have been provided with not only Project MINI-SCORE findings, but also with workshop orientation sessions by Project personnel for the interpretation of these findings. These materials are now being widely used for counseling purposes throughout the State.

Finally, this foreword would be incomplete without a sincere word of thanks to literally hundreds of people who have supported and fostered the Project throughout its duration. Without complete cooperation from area school directors, counselors, consultants and other supporting personnel plus excellent execution by the Project Director and his staff, this research study would not have enjoyed its success.

H.F.N.

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ABSTRACT

PROJECT MINI-SCORE

Project MINI-SCORE originated from a realization that basic, in-depth counseling information based upon research utilizing a pure sample of vocational students was not available in Minnesota. Data suitable for counseling purposes were extremely limited, non-additive, rarely pooled into useful form and decidedly different from school to school. Thus, no genuine data base could be aggregated upon which to systematically investigate the process of guidance, admission to schools and programs, and ultimately to study successful graduates, drop-outs, non-admissions, and other student outcomes and circumstances.

The research design of Project MINI-SCORE was formulated around three major questions.

Questions

1. Are there significant differences in basic competencies, characteristics, and other important factors which will discriminate between applicants who are rejected at the time of application to the schools, and . . .
 - a. those who are accepted, assigned to courses, but then are dropped?
 - b. those who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in a trade-related area?
 - c. those who are accepted, assigned to courses which they complete, and who then gain employment in work unrelated to the training?
 - d. those who are accepted, assigned to courses which they complete, and who are then unable to obtain employment for six months after leaving the school?
2. Are there significant differences in basic competencies, characteristics, and other important factors which will discriminate between applicants who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in trade-related occupations, and . . .
 - a. those who are accepted, assigned to courses which they complete, and who then gain employment in work unrelated to the training given them?
 - b. those who are accepted, assigned to courses which they complete, and who are then unable to obtain employment for six months after leaving the school?

3. Are there significant differences in basic competencies, characteristics, and other important factors which will discriminate between applicants who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in a trade-related occupation, where a follow-up after twelve months gives evidence of success on the job and satisfactory adjustment to the work, and . . .

those who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in a trade-related area, but who exhibit evidence of unsuccessful job experience and poor adjustment to the work after twelve months?

Test Battery

An advisory committee of five experts helped specify an appropriate test battery capable of probing for answers to these questions. The battery included:

The General Aptitude Test Battery (GATB)

The Minnesota Vocational Interest Inventory (MVII)

The Sixteen Personality Factor Questionnaire (16PF)

The Minnesota Importance Questionnaire (MIQ)

The Vocational Development Inventory (VDI)

Minnesota Scholastic Aptitude Test battery scores were obtained on eighty-five percent of the applicant population from the State-Wide Testing Program housed on the University campus. In addition, comprehensive personal data were obtained on all applicants including age, sex, years of education, high school graduation, number of dependents and marital status. A second series of questions sought information about prior high school vocational training, prior post-high school vocational training, prior related work experience, and prior unrelated work experience.

Over seventeen thousand applicants to the full-time, day programs offered in the twenty-four cooperating Minnesota Area Vocational-Technical Schools were systematically tested by qualified guidance personnel using the Project MINI-SCORE test battery.

All data were recorded on magnetic tape for analysis employing the Control Data 6600 according to programs specifically designed for the task. Comprehensive explanations of all statistical analyses are detailed in the five Technical Reports which parallel the Final Report. These reports are listed on the back page of this document for ready reference.

While test data and follow-up information flowed into the Project MINI-SCORE data bank housed in the Department of Industrial Education, University of Minnesota, many sub-research studies were conducted on blocks of data as they developed. Only the major analyses and findings have been included in this abstract.

Summary of Findings

A. With Respect to Predicting Various Success Criteria:

1. The standardized test instruments incorporated in the Project MINI-SCORE test battery were not effective in predicting the various criteria of vocational training success such as graduation versus dropping out; being employed in training-related work versus being unemployed or working on a non-training-related job; or being employed in a training-related job one year after graduation versus dropping out. Likewise, the instrument scores failed to provide significant findings associated with job satisfaction and job satisfactoriness.
2. Most of the multiple correlations were statistically significant, but their practical significance should be questioned.
3. On the problem of predicting various success criteria, the results obtained would be classified as spotty. Different instruments were minimally predictive of the various criteria and when considering the whole test battery, the results were inconsistent.

B. With Respect to Single Instrument Effectiveness:

1. No single instrument proved to be most effective for predicting all of the criteria.
2. Three instruments emerged as most useful for predicting success for vocational students. These are:
 - a. The Minnesota Vocational Interest Inventory (MVII)
 - b. The Sixteen Personality Factor Questionnaire (16PF)
 - c. The Minnesota Importance Questionnaire (MIQ)

Since these three instruments in the order listed measure factors related to interests, personality, and needs of individuals, they may well constitute the major key to counseling of vocational students.

C. With Respect to Instrument Scales:

1. Little agreement was found between specific instrument scales that are most predictive of a given criterion of success in different populations.
2. No single instrument scale was consistently correlated with each of the criteria using the same population.
3. The use of standardized test instruments, at least those incorporated in the Project MINI-SCORE test battery, as devices for predicting success, should be questioned.

D. With Respect to Prediction of Occupational Membership:

1. Each of the scales of each of the instruments indicated that differences do exist between people who are successful in the different occupations.
2. These differences exist both between graduates of different occupational training programs and between graduates who later go out on the job and who are successful in an occupation related to the program from which they graduated.
3. All scales of four of the instruments (MVII, MSAT, VDI, and GATB) were effective in differentiating both among the male groups and among the female groups when success was defined as successful graduation as well as when success was defined as employment in a related occupation.
4. In all cases, differences were significant at least at the .05 level and in most analyses, the differences were significant at the .01 level.
5. Many scales of the 16PF and the MIQ are also significantly differentiated among the male groups and among the female groups using both criteria of success.
6. In all cases, many more scales of the 16PF and MIQ were capable of significantly differentiating the female groups than were capable of differentiating the male groups.
7. Few differences were found between those who were successful graduates and those who went on to become successful in jobs related to training.

E. With Respect to Each Instrument's Ability to Differentiate Membership:

1. In all analyses conducted, the results indicated highly significant differences between groups of individuals who were successful in different occupations based upon pre-enrollment test data, both among female and male groups.
2. The greatest differences were found when using the MVII.
3. Differences among female groups were more pronounced than differences among male groups.
4. Occupations can be clustered by employing the characteristics of the people who enter them.
5. The total population of graduates and the population of those graduates who were employed in training-related occupations one year after training are more alike than different.

Discussion

Over seventeen thousand complete sets of data were accumulated utilizing the test battery employed in Project MINI-SCORE. This data base constitutes one of the most unique resources of information of its kind because all students tested were applicants to the Area Vocational-Technical Schools of Minnesota; many of these applicants became full-time students, and later, the graduates of various programs. There are other data bases, but very few which are unique in the sense that they are composed of all vocational-school-bound students. For counselors of these students, there may be no better resource extant today.

Enormous amounts of data were gathered and every single element has been translated into information usable by counselors and students for decision-making purposes. In particular, the numerous profiles built from these data provide excellent counseling aids having immediate usage with a broad range of students and occupations.

Perhaps this realization more than any other factor impelled personnel associated with the Minnesota State-Wide Testing Service to inaugurate a Vocational Testing Program employing several of the better instruments used throughout Project MINI-SCORE. This means that juniors in high school may take these tests, making it possible to use the information for counseling purposes during the senior year of high school.

Thus, Project MINI-SCORE will not terminate with the Final Report, but will continue to function throughout Minnesota schools with the single objective of strengthening the counseling process among students who express occupational aspirations.

INTRODUCTION

Project MINI-SCORE originated because the Principal Investigator could find no satisfactory answers to a number of basic questions about students in the Area Vocational-Technical Schools of Minnesota.¹ Six questions will suffice to illustrate.

1. With too many potentially capable post-high school students applying for too few available learning stations in the area schools, what criteria were used to choose those who were admitted and those who were turned away?
2. When students are chosen by a school, what criteria are employed to place them in a given program?
3. Are there measurable competencies and identifiable characteristics of successful graduates which can be obtained prior to the actual process with future applicants?
4. Is it possible that the "wrong" students are placed in learning stations while the "right" ones are turned away? What evidence either way do we have?
5. If a school official or guidance personnel were to counsel applicants, what materials or information would be useful to the process?
6. Are there identifiable differences between students who seek entrance to the Area Vocational-Technical Schools and those who apply to junior or four-year colleges or the University?

During 1964 and 1965, the writer sought answers to these and many more related questions but discovered an extreme paucity of solid data. A careful canvass of twenty-four Area Vocational-Technical Schools revealed virtually no additive type of data suitable for research purposes. One or two schools used the D.A.T. but did not aggregate them; several schools employed the General Aptitude Test Battery and again accumulated no data bank based upon it; some schools had no formalized procedures; and the rest looked over the high school transcript or combined it with one of the aptitude tests, plus in a few cases, scores on the Kuder Preference Record.

Faced with these circumstances, a design for Project MINI-SCORE was developed by which to obtain data from comprehensive measurement of basic competencies, evaluation of specific factors, cataloguing of selected characteristics; and then to determine which and how much of each element would be useful during the counseling of applicants to the post-high school, full-time day programs provided in the Area Vocational-Technical Schools of Minnesota.

¹Current terminology is "area vocational-technical institute." However, "area vocational-technical school" was used the duration of Project MINI-SCORE and appears in the Final Technical Reports, so will be used herein.

Objectives

The objectives of Project MINI-SCORE throughout its duration were stated as the following set of questions.

1. Are there significant differences in basic competencies, characteristics, and other important factors which will discriminate between applicants who are rejected at the time of application to the schools and . . .
 - a. those who are accepted, assigned to courses, but then are dropped?
 - b. those who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in a trade-related area?
 - c. those who are accepted, assigned to courses which they complete, and who then gain employment in work unrelated to the training?
 - d. those who are accepted, assigned to courses which they complete, and who are then unable to obtain employment for six months after leaving the school?
2. Are there significant differences in basic competencies, characteristics, and other important factors which will discriminate between applicants who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in trade-related occupations, and . . .
 - a. those who are accepted, assigned to courses which they complete, and who then gain employment in work unrelated to the training given them?
 - b. those who are accepted, assigned to courses which they complete, and who are then unable to obtain employment for six months after leaving the school?
3. Are there significant differences in basic competencies, characteristics, and other important factors which will discriminate between applicants who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in a trade-related occupation where a follow-up after twelve months gives evidence of success on the job and satisfactory adjustment to the work, and . . .

those who are accepted, assigned to courses which they complete, and who then gain employment in the field for which they were trained or in a trade-related area, but who exhibit evidence of unsuccessful job experience and poor adjustment to the work after twelve months?

Are there identifiable elements or combinations of variables among the basic competencies and characteristics which would be obtained at the time of initial application to the school which would enable a counselor-coordinator to predict with some degree of accuracy the ultimate success of applicants classified in the above groups?

General Related Research²

The paucity of research specific to the identification, selection, and admission of student-trainees to area vocational-technical schools attests to the need for this study.

Some years ago, Froelich expressed deep concern by stating, "There is a crying need for a positive and constructive approach to the selection of students for vocational education." (Froelich, 1956.)

A decade later, Keller completed a study of Vocationally Talented Pupils, visiting in the process one hundred vocational schools in his quest for vocational talent (Keller, 1962). Of these schools, 49 gave no selection or entrance test; 41 gave some including mechanical ability, interests, and staff-made tests; while the remainder could not be classified under either of the above. Keller's study sharply reveals the low status of comprehensive testing as a device for selecting student-trainees. Nothing since has changed his mind (Keller, 1965). Recently, Moss discovered little to report among thirteen current studies related to predicting success in vocational and technical curricula (Moss, 1963).

Yet Mobley envisioned selection as one of the crucial issues facing vocational education in the 60's (Mobley, 1960).

Many people are deeply concerned. Colver's plan for accumulating data on successful students to use as base criteria for evaluating applicants (Colver, 1961), Burt's use of the GATB (Burt, 1963), and the more extensive program developed by Margaret Crawford at the Los Angeles Trade Tech (Crawford, 1964), all have one common objective - select and admit those who are most likely to succeed. McCourt employs an exploratory, summer experience (Mccourt, 1960). The Los Angeles program is college level, the others narrow or unique; thus, none has direct application to the post-high school students in the present study.

Directly Related Research³

Patterson studied 350 students from 14 different curricula at the Dunwoody Industrial Institute in 1963 and 1954, to learn if failure could be minimized by prior analysis of test data and selected personal information about applicants (Patterson, 1955).

Using "success" (remaining in school) and "failure" (dropping out by the end of the first six months of an 18-month curriculum) as the criterion, and employing a combination of the Bennett Mechanical Comprehensive Test, Revised Minnesota Paper Form Board Test and the Army General Classification Test, Patterson found a multiple joint biserial R of .45 with the criterion. Measurements of interest on the Kuder were not found to be related to success or failure.

²This section is taken from the original research application.

³This section is taken from the original research application.

Shop and mathematics courses taken in high school were obtained and added as factors in the multiple regressions; these added factors made no significant improvement to the findings.

Also at Dunwoody, Bradley attempted to predict grades in ten curricula employing Patterson's variables by utilizing multiple regression equations (Bradley, 1958); this second researcher found correlations ranging from .62 to .75 compared with the earlier .45. Both of Bradley's findings were reported as significant. He too failed to find a significant relationship between the Kuder and the criterion.

However, with the cross-validation group (N = 319), the Minnesota Vocational Interest Inventory (MVII) was substituted for the Kuder. Correlations as high as .70 with carpentry grades and .75 with auto mechanics grades were found. This particular application of the MVII prompted Nelson to use the instrument with college-level students (Nelson, 1962). The latter was able to develop scales and scores which discriminated sharply between satisfied and dissatisfied men. The experience gained in devising the scales should prove invaluable to the conduct of the present study.

In general, the studies by Patterson and Bradley provide little specific help except, perhaps, that with the exception of the MVII, different appraisal instruments must be employed. Only the MVII, with scoring keys available for nineteen skilled trades and occupations, appears to have special relevance.

The measurement of interests offers an important dimension to the process. Carter advised that, "Vocational interests, like traits, should not be confused with any of the specific indicators or manifestations." (Carter, 1944.) Rather, obtain measures of a variety of indicators consisting of values, feelings or beliefs associated with and characteristic of selected vocations.

Interests have been shown to be amazingly stable. On this matter, the monumental research of Strong (Strong, 1955), the excellent supporting data drawn from Super (Super, 1949), the vast information assembled by Clark (Clark, 1961), and the summarizing statements of Carter (Carter, 1944) all agree with and support Darley and Hagenah, who conclude that:

"We read the weight of evidence to indicate that there is substantial stability or permanence in measured interest patterns over short or long intervals. The commonly held view that interests change capriciously or under spur of exposure or with the impact of experience is not borne out in the research studies that are available in the literature." (Darley, Hagenah, 1955.)

Since interests are assumed to be stable through a lifetime, what relationship exists between them and choice of occupation or more importantly, job satisfaction? Two researchers, Lippsett and Wilson, have shown quite clearly that persons who enter an occupation harmonious with their inventoried interests tend to be better satisfied (Lippsett, Wilson, 1954). Super supports these findings and reports that intensity of interests relate directly to persistence and completion of occupational preparation (Super, 1949). Interests tend to give direction to preparation while aptitudes tend to determine level of achievement. Super agrees with Carter that inventoried interests surpass expressed interests in predictive value.

Walker and associates have experienced considerable success in developing an interest inventory which separates successful Vocational Agriculture students rather sharply from other students (Walker et.al., 1963). This development, although interesting, cannot assist the present study because the student groups tested were in the 13 to 14 year age bracket.

Thus, interest measurement does appear to have a unique function to perform in the present study and should be included as one important element worthy of study.

Weiss and others are continuing significant research in the measurement of vocational needs with instruments devised to support predictions under their Theory of Work Adjustment (Weiss, et.al., 1964).

"Need" has been defined as a "need-for-specified-reinforcing-conditions-in-the-work-environment." The Minnesota Importance Questionnaire (MIQ) obtains measures of this need characteristic. Nine-hundred sixty samples from the Work Adjustment Project and 1348 from two business establishments were studied (Weiss et.al., 1964). While participation was purely voluntary, these groups appeared to exhibit a fairly normal distribution of age, education, years of work experience, work continuity, sex and level of work--white or blue collar, skilled or unskilled and managerial.

Analyses of these data, ". . . have shown that the MIQ has several desirable psychometric properties. The MIQ scales appear to be extremely reliable, i.e., internally consistent, indicating that the dimensions are perceived by respondents as homogeneous. The MIQ scales also appear to yield sufficient stability of measurement to be useful in vocational diagnosis and prognosis.

"Furthermore, the MIQ has been shown to be capable of discriminating among various groups of individuals, and that this discrimination occurs in meaningful ways." (Weiss et.al., 1964.)

On-going research with the MIQ appears to have unique relevance to the present research since its use will add an entirely new and important dimension worthy of exploration. Virtually nothing has been learned about the needs of potential vocational students or how they perceive of their ultimate job or occupation. And since need and motivation are so inextricably interwoven, the MIQ should reveal data of significance to the need-motivation dimension and provide insight into the need, want portion of the "need, want and can profit from instruction" specification mentioned earlier.

While data on the MIQ are not now available on persons applying for entrance to day trade vocational programs, the instrument should be used so that its usefulness can be determined.

The Minnesota Counseling Inventory (MCI)⁴, which has undergone the customary, rigorous research necessary to its wide adoption and use (Berdie et.al., 1962), provides scales to measure three major facets of adjustment virtually unexplored among applicants to day trade vocational schools. These are personality dynamics, structure and problems.

⁴By U.S.O.E. directive, the MCI was replaced by the Sixteen Personality Factor Questionnaire-Form C (16PF).

These areas of adjustment are identified by scores on the following triad: (1) FR scale, Family Relationships, (2) SR scale, Social Relationships, and (3) ES scale, Emotional Stability. In addition, four more scales are furnished to isolate the method by which adjustments are made: (4) C scale, Conformity, (5) R scale, Adjustment to Reality, (6) M scale, Mood, (7) L scale, Leadership.

Since the objective of the present study was to isolate variables which are useful in guidance, the MCI should be incorporated in the testing program in order to determine its usefulness for this purpose.

The data have been summarized in a very significant study having immediate relationship to the present research. Lunder studied the academic characteristics of all first-year, post-high students in the Area Schools of the State for fall, 1964 (Lunder, 1965). This study has special relevance with respect to the number of students, their abilities, and other important characteristics.

This investigator included 2881 students (2054 males and 827 females) in the project. Of the total, 2741 had graduated from 436 public high schools and 42 private ones. Ninety-four graduated outside the State from 90 schools; only 46 had not graduated.

Lunder found that 89 percent (2835) had finished high school since 1961. This meant that about 89 percent in the present investigator's sample would have had the Minnesota Scholastic Aptitude Test; provisions had to be made to test about 5 percent of the applicants.

Not all of the 2835 first-year people were admitted at once; area schools do this monthly. First-year students could, under this practice, include those with nine months or one month of training, yet deserve the classification of first-year students in Lunder's sample. He found that 1620 or 57.1 percent were 1964 June graduates. These data bear directly on the sample specifications, below, in the present study.

The Area School people are different as a group in significant ways from all the other groups. They do not possess the same scholastic potential as measured by these tests. The 75th percentile for the Area School group corresponds approximately with the median for the High School Juniors and Junior and State College freshmen. Their 75th percentile corresponds closely with the University's 25th percentile. From these data and comparisons, it is apparent that the Area School students tend to come from the lower end of the ability continuum.

The total research covering area vocational school applicants was so inconsequential that the present study took on increased urgency and importance.

Population

The population and sample of students included in this study consisted of all people who applied to the full-time, day programs given in the twenty-four Area Vocational-Technical Schools of Minnesota.

All secondary level (high school) vocational trainees were excluded from the sample. This did not assume that all applicants would be high school graduates but it did assume that the area school programs applied for were all classified as post-high in level.

Applicants were tested starting September 1, 1966, and continuing through October 1, 1968, during which time about 17,500 students were included. The reader should remember that not all of these applicants were actually admitted to the schools and that the data gathered during this testing process were not available to the schools for admissions purposes during the testing period.

Since a few schools were using the GATB in their counseling procedure, these scores were shared with them rather than expect duplicate testing. While this sharing of scores may have introduced a bit of contamination to the Study, its effect was judged to be very minor.

Curricular Areas Initially Identified

At the time of original funding of Project MINI-SCORE, a count of curricular areas of study was made and revealed 118 separate programs available to students in the twenty-four area schools. During Phase One of the Project, the number of programs increased rather markedly as will be shown in the preliminary research efforts using Project MINI-SCORE data. As of November 1, 1965, however, the offerings consisted of the following:

<u>Curricular Areas</u>	<u>Number of Programs</u>
1. Auto Body Repair and Rebuilding	5
2. Automotive Mechanics	13
3. Baker, Chef, Cook	4
4. Business Training, Office Practices, Clerical	13
5. Carpentry, Cabinetmaking	8
6. Cosmetology	5
7. Data Processing, Accounting	5
8. Drafting Technology	8
9. Electronic Technician, Radio Repair, T.V. Electrical, Construction	15
10. Farm Management	7
11. Machine Shop	9
12. Medical Tech	4
13. Nursing, Practical	10
14. Printing, Graphic Arts	5
15. Welding	7

Personnel

The Principal Investigator, Dr. Howard F. Nelson (now) Director and Professor, the Division of Vocational and Technical Education, University of Minnesota, holds degrees from Rutgers University, the University of Minnesota (M.A.), and the University of Kansas (Ed.D.). He has been a member of the University graduate faculty twelve years and in this capacity has taught research courses, advised numerous Ph.D. candidates with their research studies and advised many M.A. students.

Nelson has been supported with grants from the Graduate School on three occasions for research with the MVII. He has been general chairman of three national institutes for the preparation of researchers on the campus, has participated in two research training conferences, and has made regular contributions to the literature in Industrial Education.

The Project Director, Dr. David J. Pucel, has a first degree from Stout State University, an M.A. from the University of Illinois, and a Ph.D. from the University of Minnesota. He is currently an Associate Professor in the Department of Industrial Education. He has been a member of the graduate faculty for three years and carries a full load of M.A. and Ph.D. advising. He has also taught courses in research methods.

Pucel has been supported with grants from the U.S. Office of Education, the University of Minnesota Research Coordinating Unit, and the State of Minnesota to conduct research pertaining to vocational programs. He has been a presenter or participant at two national research training conferences and two U.S.O.E. sponsored training sessions. Pucel has been a leader in the A.V.A. pre-session research training sessions for four years; he has served as consultant to numerous cities, organizations, and agencies on evaluation systems and vocational counseling problems; he has contributed numerous articles to the literature; and he has made numerous presentations concerning vocational research at professional association conventions.

In addition, about ten advanced-degree students have worked part-time on the Project MINI-SCORE payroll, in most cases as an important component of their research training at the University.

Six members of the graduate faculty have served in an advisory capacity to the study and except for Dr. Dugan, who left the University, have continued in that capacity:

Dr. Jerome Moss, Jr., Professor of Industrial Education and Director of the Research Coordinating Unit, College of Education;

Dr. Willis E. Dugan, (formerly) Professor of Psychology, College of Education;

Dr. David P. Campbell, Professor of Psychology and Director, the Center for Interest Measurement, Student Personnel Office;

Dr. Donald G. MacEachern, Professor, Educational Psychology, College of Education;

Dr. George W. England, (formerly) Professor and Director, Industrial Relations Center;

Dr. David Weiss, Associate Professor and Director, Vocational Psychology Research; Department of Psychology.

PHASES OF STUDY

Before the testing program began, it became very evident that the Project would separate naturally into four quite distinct parts or phases. These are shown in Figure 1, which follows the path of a student through Project MINI-SCORE.

Phase One

Phase One encompassed the period when all applicants were given the batteries of tests; this period began on September 1, 1966, and terminated on October 1, 1968. The data-gathering instruments consisted of (1) a personal information sheet, (2) the written portions of the General Aptitude Test Battery (GATB) (Form B), (3) the Minnesota Vocational Interest Inventory (MVII), (4) the Minnesota Importance Questionnaire (30-scale version) (MIQ), (5) the Sixteen Personality Factor Questionnaire (Form C) (16PF), and (6) the Vocational Development Inventory (VDI). Minnesota Scholastic Aptitude Test (MSAT) scores were obtained from the Minnesota State-Wide Testing Program on campus, since virtually all high school students in Minnesota took the test as juniors in high school.

The particular battery of tests was selected by a jury of University test experts as providing data closely related to vocational choice and clearly appropriate to the study.

In order to operationalize the comprehensive testing program, a number of sub-systems needed to be developed. Directors of the twenty-four Area Vocational-Technical Schools assisted in identifying qualified counselors to conduct the testing phase. Personnel of each school devised their own schedules of testing; some tested monthly, others bi-monthly dependent upon need.

Provisions were made which enabled applicants to take the test batteries at the nearest school even though they expected to attend another school. Project MINI-SCORE personnel developed a system by which a student's scores became associated with him irrespective of which school he eventually attended.

All scoring was conducted by the test publishers using special scoring contracts and arrangements which returned these data to the Project office punched on IBM cards according to a specified format. All test data were housed in the Department of Industrial Education, 125 Peik Hall, University of Minnesota.

As student data began to come into the Project office, an early attempt was made at utilizing IBM cards with machine sorting. This venture proved impractical and subject to errors and was quickly replaced by a fully computerized system of editing and magnetic tape storage. A program was written for the computer to analyze the tapes, detect errors, and print these off for later corrections. Thus, data on more than seventeen thousand applicants were rendered letter-perfect by this process.

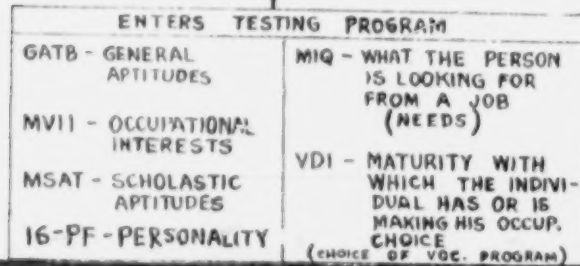
FIGURE 1

PATH OF STUDENTS THROUGH AREA SCHOOL STUDENT SELECTION PROJECT

Phase I

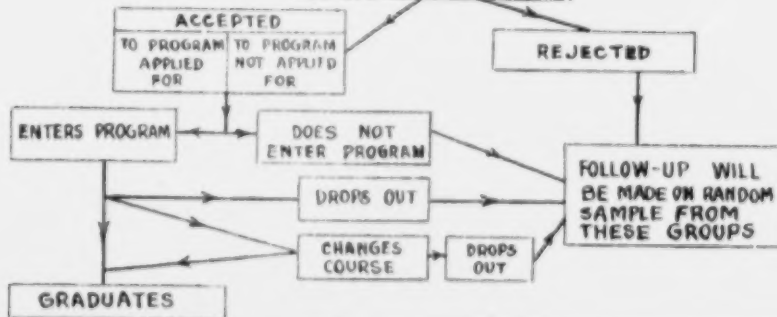
STUDENT APPLIES FOR ADMISSION

FILLS OUT PERSONAL INFO. SHEET



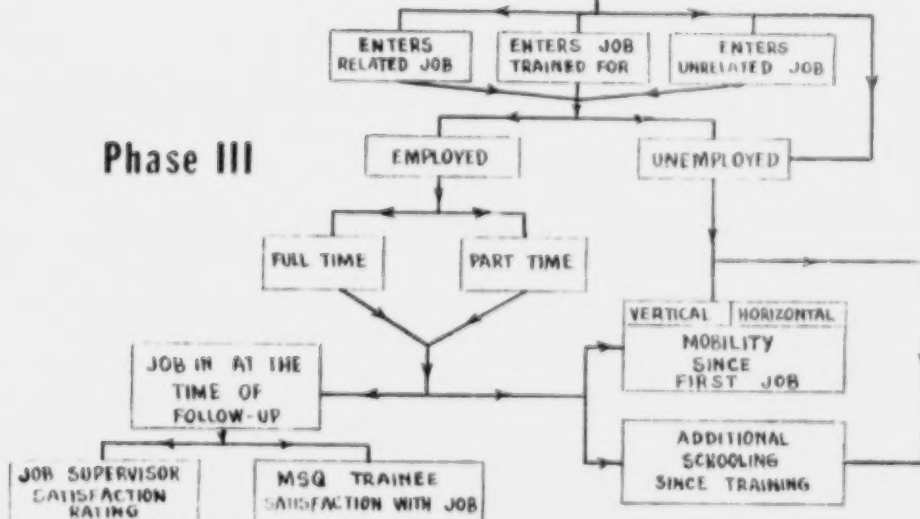
Phase II

SELECTION DECISION BY VOCATIONAL SCHOOL



BEGIN FOLLOW-UP

Phase III



Phase IV

DATA ANALYSIS AND WRITING FINAL REPORT

Phase Two

Phase Two began at the end of Phase One, although there was a short overlap to allow for the final "clean-up" of the first phase. The major activity of Phase Two consisted of keeping track of every student applicant who was tested. Since not all testees were admitted to schools, it became important to know which ones were not admitted as well as those who were admitted and assigned to courses. By reference to Figure 1, every student testee for Project MINI-SCORE was followed up in some fashion.

All applicants were classified under one of the six following categories at some time during the span of the study. Category 6, those still in training because of transfers from one course to another; because of dropping out and returning to finish; or because of other circumstances; were eliminated from the study. These student-trainees never completed training, graduated, and left the school for employment.

1. Rejected: those applicants who were not accepted at the time of application to the school.
2. Dropped: those applicants who were accepted, assigned to courses, but who dropped or were dropped from the course and school.
3. Accepted: those applicants who were accepted and assigned to courses; they completed the courses and entered employment in the field for which they were trained or in a trade-related area.
4. Accepted: those applicants who were accepted and assigned to courses; they completed the courses and then entered employment unrelated to the training obtained.
5. Accepted: those applicants who were accepted and assigned to courses; they completed the courses and were then unemployed twelve months after leaving the school.
6. Accepted: those applicants who were accepted and assigned to courses; because of dropping out temporarily and then returning, changing courses or other circumstances, they never finished their training.

Categories 3 and 4 above were subdivided into the following two groups:

- (a) Those who were successful and well-adjusted on the job.
- (b) Those who were not successful nor well-adjusted on the job.
Evidence for this classification was inferred from supervisor ratings.

For purposes of the Study, it was important to know what happened to the students in each of the above cases; because from this procedure came the sub-groups for later comparisons. These sub-groups consisted of rejectees, admissions, course-takers, course-changers, drop-outs, graduates, and various combinations of these conditions.

Phase Three

Phase Three began on July 1, 1968, the earliest date at which some graduates had completed a given course, had accepted employment, and had accumulated twelve months on a job. Graduates of this type represented the backbone of the Project because it was they who were to be intensely studied. For those graduates who had satisfactorily completed a given training program, had accepted employment, and who were working one year after graduation, what did they possess in basic competencies, capabilities, and characteristics which should be known for counseling purposes?

During this phase, each graduate, one year after graduation, was sent a preliminary letter indicating that he would be receiving a follow-up questionnaire. One week later the student was sent a four-page questionnaire printed on light green stock, a personalized letter of explanation, a return-addressed, stamped envelope, and a one-cup package of instant coffee. These conditions of follow-up had proven to be the most effective in a sub-study of follow-up procedures using the Project MINI-SCORE data (Pucel, Nelson and Wheeler, 1970).

The questionnaire was designed to gather data about additional training since graduation, employment status, work history since graduation (including the names and addresses of supervisors from each job held), salary data, and his satisfaction with his job. The latter was obtained by use of the Minnesota Satisfaction Questionnaire.⁵

A second follow-up questionnaire was sent to those students who failed to reply. When neither of these mailings produced a response, addresses were checked out through the Minnesota Drivers License Bureau, the Minnesota License Plates Bureau, the school from which the students initially graduated, and as a last resort, a phone call to his parents. From this concerted pursuit, 85 percent of all questionnaires were ultimately completed.

⁵The Minnesota Satisfaction Questionnaire and the Minnesota Satisfactoriness Questionnaire have been developed and standardized over eight years of research by the Work Adjustment Project, Industrial Relations Center, University of Minnesota. This project uses the following definitions:

"Satisfaction indicates work adjustment as viewed by the individual, i.e., the employee, while satisfactoriness presents work adjustment from the employer's viewpoint. Measures of satisfaction reflect the individual's evaluation of his work environment (i.e., his working conditions, his 'boss,' his compensation, his co-workers, etc.). The individual has certain expectations concerning the work environment and a set of 'work' attitudes which presumably grow out of, and are affected by the fulfillment or non-fulfillment of his expectations. These attitudes constitute the individual's evaluation of his work environment, i.e., his satisfaction. Optimal work adjustment from the individual's point of view would thus be when the individual evaluates his work satisfaction as 'satisfying.'

"From time to time, the employer evaluates the employee's performance as a check on the employee's activity and as a means of attaining his (the employer's) goals. The employee is judged 'satisfactory' if he conforms to these requirements and 'unsatisfactory' if he fails to conform." David Weiss, et.al., The Measurement of Employment Satisfaction, Minnesota Studies in Vocational Rehabilitation: XXIII (Minneapolis, Minnesota: Work Adjustment Project, Industrial Relations Center, University of Minnesota, 1962).

Student-provided information concerning the name and address of his immediate supervisor was utilized during the employer follow-up. Supervisors were contacted and asked to complete a questionnaire about the student-worker; the major purpose of this follow-up was to assess his satisfactoriness as a worker as seen by the employer. These data were obtained using the Minnesota Satisfaction Questionnaire (see footnote on previous page). This questionnaire was also accompanied by a personalized letter and a return-addressed, stamped envelope. The return from supervisors reached 96 percent without difficulty.

In addition, the study called for evidence of occupational mobility of horizontal or vertical type. How many graduates were unemployed, unavailable for employment, or actually employed in a job for which trained? Of equal interest, how many graduates were employed in jobs related to training and in jobs unrelated to training? If graduates were unavailable for employment, was it illness, military service, further training, or some other circumstance which caused this unavailability?

If graduates were employed in any of the three categories of employment, what evidence could be gathered to indicate satisfaction of the graduate and satisfactoriness to the employer? These were the kinds of data massed during Phase Three of the Project.

Phase Four

Phase Four of the study was devoted to an analysis of accumulated data and the preparation of the final reports.

DATA-GATHERING INSTRUMENTS
UTILIZED IN PROJECT MINI-SCORE

Personal Information Sheet

This instrument sought to obtain fairly standard data on applicants which was needed in the research in order to build a composite description of the population. The questions concerned age, years of education, number of dependents, marital status and sex.

Another series of questions probed into previous vocational training and work experience, since it was felt that both of these factors might have marked influence on later training in the area vocational-technical schools. These questions were concerned with prior high school vocational education, prior post-high school vocational training, prior related work experience, and prior unrelated work experience. From this personal information sheet the following scales or variables were obtained:

Age

Sex

Years of education

High school graduation

Number of dependents

Marital status

Prior high school vocational training

Prior post-high school vocational training

Prior related work experience

Prior unrelated work experience

The General Aptitude Test Battery (GATB, B-1002)
And Its Use By The Employment Service⁶

Development

The General Aptitude Test Battery was developed primarily to be used for the evaluation of occupational potentialities. Prior to its development, the United States Employment Service (USES) experimentally developed approximately 100 separate tests to measure the various abilities that seemed related to success in different occupations. Each time the study of a different occupation

⁶The information in this section was abstracted from: Manual for the General Aptitude Test Battery, Section III: Development (Bureau of Employment Security, Manpower Administration, United States Department of Labor, Washington, D.C., October, 1967.).

was undertaken, new tests were devised if the job analysis of that occupation indicated that some ability seemed to be important and the present store of USES tests did not already include such a test. Each test was constructed with items that were as homogeneous as possible with regard to the abilities they seemed to measure, and varied in difficulty. Over a period of time, many tests were developed composed of items such as arithmetic, vocabulary, and form perception. In addition, certain apparatus tests were developed. Through the process of factor analysis, eleven paper and pencil tests and four apparatus tests were selected from the original group of tests as the best measures of ten factors or abilities. These tests formed the first edition of the GATB, B-1001. Thus, through the development of the GATB, it became possible to measure most of the major abilities represented in the entire stock of USES tests which were related to many jobs.

The present form of the GATB, designed as B-1002, is the original GATB converted to a separate answer sheet form that includes twelve tests measuring nine aptitudes. Two forms of the B-1002 edition are available (Form A and Form B) with different answer sheets, scoring stencils and aptitude score conversion tables. The two forms differ only in the sampling of items in Parts 1 through 7.

Tests and Aptitudes Measured

The following tests and the aptitude or aptitudes measured by each are included in the GATB, B-1002, Forms A and B.

- Part 1 - Name Comparison
The examinee inspects the names appearing in two adjacent columns of names and indicates whether the names are the same or different. Measures Clerical Perception.
- Part 2 - Computation
The test consists of arithmetic exercises requiring the addition, subtraction, multiplication or division of whole numbers. Measures Numerical Aptitude.
- Part 3 - Three-Dimensional Space
The examinee is given a two-dimensional stimulus figure containing bent lines and four three-dimensional response figures. The examinee indicates which of the four response figures can be made from the stimulus figure. Measures Intelligence and Spatial Aptitude.
- Part 4 - Vocabulary
The examinee is given sets of four words and must indicate which two words of each set have either the same or opposite meanings. Measures Intelligence and Verbal Aptitude.
- Part 5 - Tool Matching
Examinee is given a stimulus drawing and four black and white response drawings and must indicate which black and white drawing is the same as the stimulus drawing. Measures Form Perception.
- Part 6 - Arithmetic Reasoning
Examinee must solve verbally expressed arithmetic problems. Measures Intelligence and Numerical Aptitude.

Part 7 - Form Matching

Examinee is given a stimulus and response group of variously shaped line drawings. He must indicate which response figure is exactly the same size and shape as each figure of the stimulus group. Measures Form Perception.

Part 8 - Mark Making

Examinee must draw two vertical and one horizontal line beneath the two vertical lines on a series of squares working as rapidly as possible. Measures Motor Coordination.

Part 9 - Place⁷

Examinee moves two pegs simultaneously, one in each hand, from an upper pegboard area to corresponding holes located in the lower area of the same pegboard in three timed trials. Measures Manual Dexterity.

Part 10 - Turn⁷

Using the lower section of the pegboard, the examinee removes a peg, turns it over and places the opposite end of the peg into the hole from which it was removed using his preferred hand. Three timed trials are given. Measures Manual Dexterity.

Part 11 - Assemble⁷

The examinee is given rivets, washers and a finger dexterity board. Using his preferred hand, he removes a rivet from the upper section of the board, assembles a washer on the rivet, and places the assembly in the corresponding hole in the lower segment of the pegboard. One timed trial is given. Measures Finger Dexterity.

Part 12 - Disassemble⁷

The examinee is required to disassemble completed assemblies of rivets and washers in a manner opposite to those actions required for Part 11. One timed trial is given. Measures Finger Dexterity.

The nine aptitudes measured by the GATB B-1002 and the definitions of these aptitudes are stated below. The letter symbol used to identify the aptitude precedes each aptitude name.

Aptitude G - Intelligence

General learning ability. The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school. Measured by Parts 3, 4, and 6.

Aptitude V - Verbal Aptitude

The ability to understand the meaning of words and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs.

Parts 9, 10, 11 and 12 were not administered in present research.

Aptitude N - Numerical Aptitude

Ability to perform arithmetic operations quickly and accurately.
Measured by Parts 2 and 6.

Aptitude S - Spatial Aptitude

Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space. Measured by Part 3.

Aptitude P - Form Perception

Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and discriminations and to see slight differences in shapes and shadings of figures and widths and lengths of lines. Measured by Parts 5 and 7.

Aptitude Q - Clerical Perception

Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers. and to avoid perceptual errors in arithmetic computation. Measured by Part 1.

Aptitude K - Motor Coordination

Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly. Measured by Part 8.

Aptitude F - Finger Dexterity⁸

Ability to move the fingers and manipulate small objects with the fingers, rapidly or accurately. Measured by Parts 11 and 12.

Aptitude M - Manual Dexterity⁸

Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions. Measured by Parts 9 and 10.

Use by United States Employment Service

GATB norms have been determined for adults and for high school grades 9 and 10. They have been established to appraise the aptitudes required in a large variety of occupations. Employment Service individual occupational norms for the GATB are classified in terms of an Occupational Aptitude Pattern (OAP) structure. The OAP norm structure includes various combinations of the nine aptitudes measured by the GATB B-1002. These norms (OAP's) have been validated on the basis of data collected on various occupational groups. Each OAP for a given occupation or group of occupations having similar aptitude requirements consists of the most significant aptitudes and minimum cut-off scores on these aptitudes. Individual performance on the GATB is evaluated in terms of the OAP's through the use of conversion tables.

⁸Aptitudes F and M were not utilized in present research.

Although the validity of the GATB has been established for many current occupational fields, there still remain many emerging occupations for which occupational norms have not yet been established. Test and occupational data are continually being obtained and additional occupations are being added to the norm structure while outdated norm structures are being removed.

The GATB tests and aptitudes possess substantial correlations with other tests which sample the same abilities. For example, the Spatial Aptitude of the GATB has high correlations with the spatial components of the DAT, the Primary Mental Abilities and the Revised Minnesota Paper Form Board. The GATB Verbal Aptitude correlates highly with the DAT Verbal test and Vocabulary subtest of the Cooperative English Test. Many of the correlations between these similar ability tests exceed .70.

Correlations are quite low in studies in which the GATB aptitudes are correlated with the Minnesota Vocational Interest Inventory or the Kuder Preference Record.

Further information regarding the Occupational Aptitude Patterns and the GATB correlations with specific tests can be found in the Manual for the General Aptitude Test Battery, Section III: Development (1967).

Reliability studies have been conducted with the GATB under test, retest conditions with the second testing usually producing an increase in aptitude test scores. Results of these studies, however, indicate that the aptitudes of the GATB are measured reliably in the types of situations in which the battery is commonly used. These studies were conducted with samples from high school, college and adult populations using test, retest intervals ranging from one week to one year. Reliability coefficients for most of the aptitudes were in the range from .80 to .90. A practice effect was consistently observed for all aptitudes. The mean score increase often exceeded ten points for some aptitudes, a fact which should be noted by people who may be involved with interpreting retest scores.

The Minnesota Vocational Interest Inventory⁹

Development

The research which forms the foundations for the Minnesota Vocational Interest Inventory (MVII) had its beginning during World War II in the development of a vocational interest inventory which could assist Navy counselors in the assignment and placement of Navy enlisted personnel. After the war, the findings of this research were applied to the study of a wide sampling of civilian nonprofessional occupations.

The MVII is an inventory which provides systematic information on the interest patterns of men and women in nonprofessional occupations. However, most of the work in the past has been done with men. It is composed of 158 triads of brief statements describing the tasks or activities involved

⁹Kenneth E. Clark and David P. Campbell, Minnesota Vocational Interest Inventory (New York, the Psychological Corporation, 1965).

in a number of different occupations. Examinees indicate their preferences for the tasks in each triad by choosing the one activity most liked and the one activity most disliked. For each person who completes the inventory, scores are derived to provide an index of similarity between his or her interests and the interests of people in a variety of nonprofessional occupations.

The MVII authors believe that, for general purposes, the inventory would be suitable for students in the ninth grade or higher, or for people who are at least fifteen years of age. However, they indicate caution should be observed when interpreting the scores of fifteen or sixteen-year olds as occupational interest levels have not fully crystallized for this age group.

The MVII assumes that workers in a given occupation possess certain likes and dislikes in common and that these differ from those of workers in other occupations. The MVII accomplishes for the nonprofessional occupations what the Strong and the Kuder do for professional groups. Currently, MVII data are available on the interest patterns of over seven thousand civilian workers distributed among more than twenty civilian occupations. The validity of the occupational scoring keys is based on the fact that they are "empirical" keys that have been developed through scoring responses that differentiate men in an occupation from a group of tradesmen in general. Validity indices are not reported for the homogenous keys as these keys were not used in the past to separate groups but were an attempt to draw together items with a common core into scales that can be used to understand the nature of the differences between groups.

The extent to which an individual's interest pattern matches that of a given group is determined by applying a key to the interest inventory. Each key was developed by comparing the item responses made by a specific occupational group with those made by a group of tradesmen-in-general. The key represents a profile that provides a method of evaluating an individual's interests against the interest profile of an occupational group.

Inventory Keys

Two sets of keys, "occupational" and "homogeneous" have been developed for interpreting inventory results. The occupational keys provide a means of comparing an individual's interests with those of people employed in specific occupations. Each of the twenty-one keys bears the name of the occupational group which served as the basis for its development. These keys are:

Baker
Food Service
Milk Wagon Driver
Retail Sales Clerk
Stock Clerk
Printer
Tabulating Machine Operator
Warehouseman
Hospital Attendant
Pressman
Carpenter

Painter
Plasterer
Truck Driver
Truck Mechanic
Industrial Education Teacher
Sheet Metal Worker
Plumber
Machinist
Electrician
Radio-TV Repairman

Nine homogeneous keys were derived by identifying clusters of inventory items that correlated highly with each other using the tradesmen-in-general group. These clusters could be viewed as nine factors underlying interest as measured by the MVII. These clusters were named by inspecting the items which formed each cluster. The homogeneous keys and their descriptions are as follows:

H-1: Mechanical

Indicates interest in mechanical things, machine operation and design, or about home repairs of mechanical and simple electrical gadgets.

H-2: Health Service

Expresses interests in medical and hospital services, activities and occupations, or in working in medical, biological, or chemical laboratories.

H-3: Office Work

Indicates interests in general clerical work and office machine operation, bookkeeping and accounting, and office management practices.

H-4: Electronics

This key expresses an interest in the maintenance, operation, and construction of electronic equipment, and the repair and construction of electrical systems and devices.

H-5: Food Service

Indicates interests in the preparation of food and menu planning.

H-6: Carpentry

This cluster deals primarily with interests relating to carpentry, cabinetmaking and furniture construction.

H-7: Sales-Office

Two clusters of interests are indicated here. The larger deals with a variety of verbal activities, while the other relates to aesthetic interests.

H-8: Clean Hands

Indicates an interest in those occupations which possess "clean hands" kinds of activities.

H-9: Outdoors

This key reflects an interest in athletics and other outdoor activities.

Standard Reporting of Scores

The scores on the MVII are relatively independent of intelligence or abilities as measured by aptitude tests. The scores summarize the individual's preferences for work; they do not indicate those areas in which he has the greatest skill or the greatest possibility of obtaining competence.

Scores on all keys are reported as standard scores based on the appropriate occupational group for each occupational key and on the tradesmen-in-general group for the homogeneous keys.

To facilitate the interpretation of the scores, a profile of standard T-scores is provided as well as the scores themselves. About two-thirds of any given occupational group score above 45 on their own scale. The occupational keys are clustered on the profile sheets into groups determined by a study of the intercorrelations among keys.

The Minnesota Importance Questionnaire¹⁰

The need characteristics of potential vocational students are assessed by use of the Minnesota Importance Questionnaire (MIQ). "Need" has been defined as, "need for specified reinforcing conditions in the work environment." Stated another way as a question, "What personal needs does an individual feel the job should fulfill?" This area represents a new and relatively unexplored consideration among potential students and one which should provide additional insight into the need-motivation dimension.

The MIQ, 1967 version, is a 210-item, pair-comparison instrument designed to measure vocationally-relevant need dimensions. These need dimensions refer to specific reinforcing conditions which have been found to be important to job satisfaction.

Since Project MINI-SCORE began testing on September 1, 1966, the then current edition of the MIQ was utilized. This version contained 30 scales whereas the 1967 version was reduced to 20 by Industrial Relations research personnel. In the listing of variables and scales which follow, the current 20 scales are followed by statements which best describe their different dimensions.

Scales

1. Ability Utilization: I could do something that makes use of my abilities.
2. Achievement: The job could give me a feeling of accomplishment.
3. Activity: I could be busy all the time.
4. Advancement: The job would provide an opportunity for advancement.

¹⁰David Weiss, et.al., Manual for the Minnesota Importance Questionnaire. (Minnesota Studies in Vocational Rehabilitation: XXVII, June, 1971, Bulletin 54).

5. Authority: I could tell people what to do.
6. Company Policies and Practices: The company would administer its policies fairly.
7. Compensation: My pay would compare well with that of other workers.
8. Co-workers: My co-workers would be easy to make friends with.
9. Creativity: I could try out some of my own ideas.
10. Independence: I could work alone on the job.
11. Moral Values: I could do the work without feeling that it is morally wrong.
12. Recognition: I could get recognition for the work I do.
13. Responsibility: I could make decisions on my own.
14. Security: The job would provide for steady employment.
15. Social Service: I could do things for other people.
16. Social Status: I could be "somebody" in the community.
17. Supervision - Human Relations: My boss would back up his men (with top management).
18. Supervision - Technical: My boss would train his men well.
19. Variety: I could do something different every day.
20. Working conditions: The job would have good working conditions.

The Minnesota Scholastic Aptitude Test¹¹

The Minnesota Scholastic Aptitude Test (MSAT) was developed to provide a single score useful in predicting how well students will do in college. It consists of 78 items and requires 50 minutes testing time. A modification of the Ohio State Psychological Examination, in 1958 it replaced the 1952 college edition of the ACE, formerly used in the State-Wide College Testing Program in Minnesota. On each page of the test the student first encounters a reading passage, followed by questions based on the passage. He then attempts same-opposites and analogies items, which measure his vocabulary and understanding of the relationship of words. The test was developed for use with high school juniors.

In Project MINI-SCORE, a total score on the MSAT was utilized as a variable.

¹¹The information on MSAT is from: Ralph F. Berdie, et.al., Counseling and the Use of Tests: A Manual for the Statewide Testing Programs of Minnesota (Minneapolis, Minnesota, the Student Counseling Bureau, University of Minnesota, 1962).

The Vocational Development Inventory¹²

The Vocational Development Inventory (VDI) was developed by John O. Crites at the University of Iowa (Crites, 1969). The VDI was designed to assess a combination of five aspects of vocational maturity: ". . . (1) involvement in the process of vocational choice, (2) orientation toward the problem of vocational choice, (3) independence in decision-making, (4) preference for factors in vocational choice, and (5) conceptions of vocational choice." (Crites, 1969 , p. 6).

The instrument contains fifty true-false items which results in one score that is directly related to age and grade level. It was originally developed for use with students in grades five through twelve. Two scales were to be developed, an "attitude" scale and a "competence" scale. Only the attitude scale was included in Project MINI-SCORE, since the competence scale was not completed at the time the Project was initiated. Crites has indicated that the attitude scale objectively measures individual differences in the maturity of vocational attitudes.

In Project MINI-SCORE, a score on the attitude scale was employed as a variable.

The Sixteen Personality Factor Questionnaire¹³

The Sixteen Personality Factor Questionnaire (16PF) is an objectively-scorable test devised through basic research in psychology to give the most complete coverage of personality possible in a brief time. Planned for the age of seventeen through the mature adult range, its reading level varies for different forms.

Coverage of personality is insured by the sixteen functionally-independent and psychologically-meaningful dimensions isolated by over twenty years of factor analytic research on normal and clinical groups.

The personality factors measured are not just peculiar to the 16PF Test. They have been established as unitary, psychologically-meaningful entities in many researches in various life situations. They enter into general psychological theory and into tests used at other ages and in other cultures.

These sixteen dimensions or scales are essentially independent; that is to say, the correlation between one and other is usually quite small. Therefore, having a certain position on one does not prevent the person's having any position whatever on any other. Thus, each of the sixteen scales brings an entirely new piece of information about the person, a condition not found in many alleged multi-dimensional scales.

¹²The information in this section was abstracted from: John O. Crites, The Maturity of Vocational Attitudes in Adolescence (Iowa City, Iowa, the University of Iowa, 1969).

¹³The information for this section was quoted from: Manual for Forms A and B, Sixteen Personality Factor Questionnaire (Champaign, Illinois, the Institute for Personality and Ability Testing) and Raymond B. Cattell, Form C of the Sixteen Personality Factor Questionnaire, "The 16PF Test" (Champaign, Illinois, The Institute for Personality and Ability Testing, Second Edition, 1962).

In terms of the personality factors measured, Form C is exactly parallel to Forms A and B. An extensive factor analysis, originally based on many hundreds of new questions, was carried out, as reported in detail elsewhere. It aimed to give the maximum reliability and validity of measurement possible with only six items per factor. The results showed good validity and confirmed that the same factors are being measured as in the A and B 16PF forms. Thus, Form C, like Forms A and B, tests as much of the total personality as can be covered by questionnaire, according to the most up-to-date psychological research. It gets at such basic, independent factors as emotional stability, dominance, timidity, shrewdness, intelligence, enthusiasm (urgency), conservatism, nervous tension, etc.; and the factors involved in neuroticism, morale, leadership, social adjustment, and vocational preference and success. Following are the scales of the 16PF:

Aptitude A: Aloof vs Warm, outgoing

Aptitude B: Dull vs Bright

Aptitude C: Emotional vs Mature

Aptitude E: Submissive vs Dominant

Aptitude F: Glum, silent vs Enthusiastic

Aptitude G: Casual vs Conscientious

Aptitude H: Timid vs Adventurous

Aptitude I: Tough vs Sensitive

Aptitude L: Trustful vs Suspecting

Aptitude M: Conventional vs Eccentric

Aptitude N: Simple vs Sophisticated

Aptitude O: Confident vs Insecure

Aptitude Q1: Conservative vs Experimenting

Aptitude Q2: Dependent vs Self-sufficient

Aptitude Q3: Uncontrolled vs Self-controlled

Aptitude Q4: Stable vs Tense

PRELIMINARY ANALYSES OF DATA

As of November 1, 1965, Project staff were expected to employ the University's Control Data 1604, UMSTAT 50 program and other indigenous programs available for the analysis of data. However, almost simultaneously with funding, the 1604 was removed and replaced with Control Data's 6600 computer which immediately increased analysis capability at least ten-fold. The installation of the 6600 also precipitated the change from IBM card information storage to magnetic tape storage of data.

Since the study began, numerous research efforts have been completed. Many of them dealt with developing an effective operating system for gathering data which was necessary for making operational decisions. Another group of research efforts dealt with investigating methods of data analysis to determine which methods were both logically sound in relation to the objectives of the Project and which possessed the greatest potential for yielding results. It soon became apparent that very few researchers had ever attempted to develop an efficient generalizeable operating system.

Due to an inability to locate people in the behavioral sciences with sufficient background in computerized data handling, people from business and the sciences had to be identified; Project personnel then undertook the task of assimilating information from people from many fields who were not acquainted with educational problems, and then synthesizing this conglomerate of information into a workable system. Then the staff needed to develop proficiency in operating the system, at the same time utilizing the potential of the advanced computer technology now available.

No attempt will be made in this general report of Project MINI-SCORE to elucidate on the complexities involved in programming the 6600 for analyses of data, since this discussion falls more logically within the province of the technical reports which parallel this report.

Needless to say, not only were huge amounts of data being gathered in Project MINI-SCORE, but an entirely new system for the processing of data needed to be developed. Early attempts at investigating the relative usefulness of various statistical analyses techniques for dealing with the data were most revealing. Some of the early attempts will be described in this document.

Preliminary Research Analyses Using Applicant Data

During the first four-and-a-half years as test data were gathered on all applicants, the separate schools admitted or rejected applicants according to each school's procedures or availability of learning stations. From this point, those admitted and placed in training programs went about that training for anywhere from nine months to 24 months before becoming ready for placement in employment.

At this stage, the most important group of candidates for intensive study were those who had completed training programs and were working twelve months after graduation. Elementary arithmetic tells us that students in nine-month programs could become available for intensive study 21 months after initial admission. Those in 24-month programs could become available at the end of 36 months. In the meantime, Project personnel were amassing data but possessed little insight into its real meaning.

This circumstance precipitated three preliminary analyses of data in order to "get a feel" for the accumulation of detailed information on students (Pucel, Nelson, 1969). With sizable numbers of cases available, the first analysis was done in 1967 (Pucel, Nelson, 1967) to reveal descriptive data as to the type of student who was applying to the post-high school Area Vocational-Technical Schools of Minnesota.

What Type of Person Applied?

The population used in this analysis consisted of 6,400 applicants to the 24 cooperating Area Vocational-Technical Schools of Minnesota during the period from October 1, 1966, to July 1, 1967. The first analysis indicated that about 69% of the applicants were 18 years of age or under, 23% were between 19 and 21, and 8% were over 21 years of age. About 57% of the applicants were boys and 43% were girls. Most of the applicants, 92.5%, were high school graduates; 7% had between 9 and 11 years of education; and only 0.5% had eight years or less. About 93% had no dependents and only 7% were married. About 43% of the applicants indicated they had had prior post-high school vocational training. About 77% indicated that they had had no previous work experience related to the program they wished to enter, although about 57% indicated they had had unrelated work experience.

The findings of the first analysis indicated that many girls as well as boys apply for admission to the Area Vocational-Technical Schools of Minnesota. They are well-educated, most of them are high school graduates, and they typically apply immediately after high school. Few are married and few are supporting other dependents. Many of them have had some work experience and indicated that they had some form of vocational training in high school.

Were Test Battery Data Independent?

The population used in the second preliminary analysis (Pucel, Nelson, 1967) consisted of 1,391 students newly enrolled during the fall of 1966 in one of eighteen different vocational-technical curricula at the Minnesota Area Vocational-Technical Schools. Table 1 lists the curriculum groups used in the analysis and the number of subjects in each group.

The second preliminary analysis investigated the inter-correlations that existed between measures derived from the seven different instruments used in the Project. The second also investigated whether or not each measure could individually differentiate between a group of individuals entering one program and groups of individuals entering other programs. The answers to each of the questions raised in the second analysis were encouraging. All of the instruments appeared to be measuring relatively independent variables and each was capable of significantly differentiating at least two of the eighteen different curriculum groups at the .05 level, as measured by a two-sample T-test.

TABLE 1
POPULATION USED FOR SECOND PRELIMINARY ANALYSIS

CURRICULUM	NUMBER
1. Practical Nursing	67
2. Data Processing	45
3. Secretarial Training	247
4. Electronics	56
5. Cosmetology	33
6. Accounting	164
7. Clerical Training	167
8. Architectural Drafting	41
9. Fluid Power Technology	30
10. Mechanical Drafting and Design	52
11. Sales	31
12. Power and Home Electricity	51
13. Printing and Graphic Arts	25
14. Carpentry	47
15. Machine Shop	80
16. Automotive	139
17. Agri-Technology	29
18. Welding	87
TOTAL 1,391	

The criterion used to judge whether or not two factors measured by two different instruments were relatively independent was a correlation of .55. A correlation of .55 between two sets of scores indicates that the two measures have 30.25% common variance; or conversely, 69.75% of what each measures is independent of the other. For purposes of the preliminary analysis, approximately 70% non-overlap or independence was judged to be sufficient to indicate that the two measures were relatively independent.

A review of a sample of four of the eighteen correlation matrices indicated that none of the factors measured by one instrument correlated above .55 with factors of another instrument except the Minnesota Scholastic Aptitude Test score and the GATB Verbal Aptitude score. A review of the correlation between these two scores for each of the eighteen curricula indicated that they correlated above .55 for seven curricula. Although these two scores appear to be somewhat related, the relationship did not appear consistent enough to reject either instrument. Therefore, both were retained in the test battery.

Do Enrollees in Different Programs
Possess Traits in Common?

A third preliminary analysis of the data investigated the commonalities between groups enrolled in different vocational programs with respect to interests, aptitudes, job needs and personality factors (Pucel, Nelson, 1969).

Profiles for each of the eighteen curricula were constructed using standard scores for each of the multi-factor instruments used in the Project (MVII, 16PF, MIQ, and GATB). A combined profile was also constructed for each curriculum using all of the scales on all of the instruments indicated above. The commonalities between the profiles were determined by using the DuMas coefficient of profile similarity.¹⁴ By inspection, profiles were then grouped on the basis of profile similarity coefficients. Each of the curriculum groups was randomly assigned a number before the profile coefficients were computed and the groups constructed. After all groupings were constructed for each instrument and the combination of instruments, the numbered curricula were translated back to names. The above procedure was used in an attempt to eliminate the bias which might occur during grouping because the people involved in constructing the groupings might have stereotyped notions about the occupations.

The following curricula were grouped together using data obtained from the different instruments used in the Project:

General Aptitude Test Battery

(seven aptitude scores obtained from written portions)

a. GROUP 1

Electronics
Power and Home Electricity

b. GROUP 2

Architectural Drafting
Data Processing
Fluid Power Technology

c. GROUP 3

Automotive
Carpentry
Machine Shop
Mechanical Drafting and Design
Printing and Graphic Arts
Sales
Welding

d. GROUP 4

Accounting
Agri-Technology
Clerical Training
Cosmetology
Practical Nursing
Secretarial Training

¹⁴ A discussion of this technique as well as alternative techniques can be found in the book Multivariate Statistics for Personnel Classification by Rulon and others (New York, 1967).

Minnesota Vocational Interest Inventory
(nine homogeneous scales)

a. GROUP 1

Agri-Technology
Architectural Drafting
Automotive
Carpentry
Electronics
Fluid Power Technology
Machine Shop
Mechanical Drafting and Design
Power and Home Electricity
Printing and Graphic Arts

b. GROUP 2

Accounting
Clerical Training
Cosmetology
Data Processing
Practical Nursing
Sales
Secretarial Training

Sixteen Personality Factor Questionnaire
(16 personality factor scales)

a. GROUP 1

Data Processing
Fluid Power Technology
Mechanical Drafting and Design

d. GROUP 4

Accounting
Clerical Training
Cosmetology
Practical Nursing
Secretarial Training

b. GROUP 2

Agri-Technology
Architectural Drafting
Electronics
Power and Home Electricity
Printing and Graphic Arts

e. GROUP 5

Sales

c. GROUP 3

Automotive
Carpentry
Machine Shop
Welding

Minnesota Importance Questionnaire
(thirty needs scales)

a. GROUP 1

Data Processing
Electronics

c. GROUP 3

Automotive
Carpentry
Fluid Power Technology
Machine Shop
Power and Home Electricity
Welding

b. GROUP 2

Agri-Technology
Architectural Drafting

Minnesota Importance Questionnaire (continued)

d. GROUP 4

Accounting
Clerical Training
Cosmetology
Practical Nursing
Secretarial Training

e. The following programs did not fall into any groupings.

Mechanical Drafting and Design
Printing and Graphic Arts
Sales

Based upon the combined profiles using all of the scales of the above instruments, the following clusters were found. The total number of dimensions in each profile was 62.

a. GROUP 1

Data Processing
Electronics

c. GROUP 3

Accounting
Clerical Training
Cosmetology
Practical Nursing
Sales
Secretarial Training

b. GROUP 2

Agri-Technology
Architectural Drafting
Automotive
Carpentry
Fluid Power Technology
Machine Shop
Mechanical Drafting and Design
Power and Home Electricity
Printing and Graphic Arts
Welding

Based upon the above curriculum groupings derived from profile comparisons by test as well as for the combination of the tests, some curricula consistently grouped together. The groups derived from the comparison of the combined profiles appeared to represent a summary of all of the profile groups derived from the individual tests. The curricula appeared to consistently group in terms of trade and industrial curricula and business and social service curricula.

Essentially the same curricula clustered together regardless of the test used except for sales and agri-technology. This suggested that individuals in the groups were similar on many dimensions. They had similar needs, interests, abilities, and personalities as defined by the instruments used in this study. This does not mean that they were identical. Curricula within a group had profiles more similar to curricula in that group than they had to curricula outside the group.

Preliminary Research Using Graduate Data

Midway through the applicant testing phase of Project MINI-SCORE, when sizable amounts of data had been gathered, numerous preliminary analyses became possible and were conducted. In this section of the Final Report, several of these preliminary studies are reported, using graduate data. All of them are introduced by posing questions typically raised by Area Vocational-Technical School directors, as well as by vocational educators in general.

How Do the Area Vocational-Technical School Graduates Compare With Other Selected School Populations in Minnesota?

A partial answer to this question was available by analyzing scores on the Minnesota Scholastic Aptitude Test battery (MSAT) since the Minnesota State-Wide Testing Program has administered this battery to high school juniors for many years. For purposes of this preliminary study, this agency provided data on the group of students tested during the 1963-64 school year. Most of the area vocational-technical school graduates who completed selected programs were part of the group tested in 1963-64, as were entering freshmen of the Minnesota State College system during the fall of 1966.

Table 2 which follows shows data on the comparable high school juniors, selected groups of area vocational-technical school graduates, and entering state college freshmen. Both state college freshmen and the area vocational-technical school graduates appear to be quite different from the total school group by inspection of the mean scores as measured by the MSAT. The state college groups show higher mean scores than the high school group, and most of the vocational graduate groups appear to have lower mean scores. Thus, the evidence suggests that area school students are indeed a somewhat different school population. (See Pucel, Nelson, 1969.)

What Happens to Graduates of Minnesota's Area Vocational-Technical Schools?

The population utilized in this study (Pucel, Nelson, 1969) consisted of 1241 people who graduated from one of 43 of the more than 60 curriculum areas offered in the post-high school, Area Vocational-Technical Schools during the period from June, 1967, to July, 1968. All Project MINI-SCORE people were followed up at least one year after they had completed their respective programs. Four hundred eighty-eight were males, while 753 were females. Each person was sent an extensive questionnaire which he completed and returned. It is important to note that the 1241 students used in this preliminary study represented 85 percent of the original group followed up who returned the questionnaire.

TABLE 2

COMPARISON OF MINNESOTA SCHOLASTIC APTITUDE TEST SCORES
OF HIGH SCHOOL JUNIORS (1964), STATE COLLEGE ENTERING FRESHMEN (1966)
AND AREA VOCATIONAL-TECHNICAL SCHOOL GRADUATES (1967-68)

CATEGORY	N	MEAN	STANDARD DEVIATION
<u>High School Juniors*</u> (1963-64)			
Total Group	62434	34.40	14.70
Males	31431	33.40	14.50
Females	31003	35.50	14.90
<u>State College Freshmen*</u> (1966)			
Total Group	6288	37.30	12.10
Males	3489	35.10	11.40
Females	2799	40.00	12.50
<u>Area Vocational-Technical School Graduates</u> (1967-68)			
Automotive	155	25.24	9.68
Carpentry	62	25.37	8.21
Machine Shop	63	24.14	9.11
Mechanical Drafting and Design	83	29.52	8.86
Power and Home Electricity	67	26.28	9.13
Welding	101	23.10	8.25
Accounting	166	29.19	10.46
Clerical Training	206	25.61	9.26
Cosmetology	114	27.57	9.89
Practical Nursing	216	33.56	11.03
Secretarial Training	304	32.00	10.27

*These data were furnished by the Minnesota State-Wide Testing Program.

What Was the Employment Status of Graduates After One Year?

The question of employment status was viewed from two different perspectives, one of a narrow definition of job relatedness to training programs and one of a broader definition. The narrow definition specified that the person be employed in the specific occupation for which trained in order for his job to be termed "related" to training. The broader definition only required that the student be employed in the specific occupation or a similar occupation. For example, using the narrow definition a person who graduated as an auto mechanic and became a diesel mechanic would be classified as being employed in an occupation "unrelated" to training. Using the broad definition, he would be classified in an occupation "related" to training. In both cases, a person was classified as "unemployed" if he wished to become employed but could not find employment; and a person was classified as "unavailable for employment" if he voluntarily or involuntarily was not available. Table 3 summarizes employment status using the narrow definition of relatedness and Table 4 summarizes the data using the broad definition.

Both Tables 3 and 4 show that 52 percent of the male graduates are employed one year after graduation, 81 percent of the female graduates, and 70 percent of the total group. At first impression, the 52 percent for males appears low; but this is explainable as one later examines the reasons why 45 percent of the males are unavailable for employment. Only 3 percent of the males are classified as unemployed using the definition specified earlier, 9 percent of the females, and 7 percent of the overall group.

As one examines the differences between how many people are classified as "related" using the narrow and broad definitions, it becomes apparent that only 3 percent of the males and 14 percent of the females are employed in jobs which are closely related to the training program they undertook but not identical to it.

TABLE 3
EMPLOYMENT STATUS AFTER ONE YEAR
(Narrow Definition)

CATEGORY	MALES N = 488	FEMALES N = 753	TOTAL GROUP N = 1241
Employed Related	36%	60%	52%
Employed Unrelated	16%	21%	18%
Unemployed	3%	9%	7%
Unavailable for Employment	45%	10%	23%
	100%	100%	100%

TABLE 4
EMPLOYMENT STATUS AFTER ONE YEAR
(Broad Definition)

CATEGORY	MALES N = 488	FEMALES N = 753	TOTAL GROUP N = 1241
Employed Related	39%	74%	60%
Employed Unrelated	13%	7%	10%
Unemployed	3%	9%	7%
Unavailable for Employment	45%	10%	23%
	100%	100%	100%

If Graduates Were Employed,
Were They Employed Full-Time or Part-Time?

Table 5 which follows indicates that 95 percent of the employed males and 93 percent of the employed females were working full-time. Full-time employment, hopefully, should be the expected outcome of vocational and technical training, so this sub-study indicates that Minnesota Area Vocational-Technical School graduates fare well in this respect.

TABLE 5
PERCENTAGE OF GRADUATES EMPLOYED FULL AND PART-TIME
ONE YEAR AFTER GRADUATION

CATEGORY	MALES N = 247	FEMALES N = 614	TOTAL GROUP N = 861
Full-Time	95%	93%	94%
Part-Time	5%	7%	6%
	100%	100%	100%

If Graduates Were Unavailable for Employment,
Why Were They Unavailable?

Table 6 indicates the reasons for unavailability for employment and should be read in conjunction with Tables 3 and 4. In those tables, 45 percent unavailability was shown for males. The military reason shown below accounts for 83 percent, most of that unavailability.

TABLE 6
REASONS FOR UNAVAILABILITY FOR EMPLOYMENT
ONE YEAR AFTER GRADUATION

CATEGORY	MALES N = 224	FEMALES N = 70	TOTAL GROUP N = 294
Military	83%	3%	64%
Further Training	15%	17%	15%
Illness	1%	1%	1%
Other	1%	79%	20%
	100%	100%	100%

Of the 10 percent of females not available for employment, 79 percent, as shown above, are categorized as "other;" this category includes marriage, pregnancy, and similar constraints on work. About 15 percent of men and women were found to be in further training.

Did Graduates Take Part in
Additional Training Since Graduation?

The amount of additional training taken beyond that obtained initially in the Minnesota Area Vocational-Technical Schools has been summarized in Table 7. Of the 1241 people in this population, 53 percent of the men and a fourth of the women took additional training.

Most of those taking additional training received it either on the job or in specialized military programs.

TABLE 7
ADDITIONAL TRAINING ONE YEAR AFTER GRADUATION

CATEGORY	MALES** N = 488	FEMALES*** N = 753	TOTAL GROUP N = 1241
None	47%	76%	64%
On-the-job training	16%	11%	13%
Public vocational school	4%	2%	3%
Private vocational programs	1%	0%	.3%
College/junior college	5%	4%	4.7%
Apprenticeship	6%	2%	4%
Specialized occupational military training	17%	1%	7%
Other	4%	4%	4%
	100%	100%	100%

*Sixty-four people had two additional types of training and 11 had three types.

**Forty-nine males had two additional types of training and 6 had three types.

***Fourteen females had two additional types of training and 5 had three types.

How Many Different Jobs
Did Graduates Have Since Graduation?

Table 8 summarizes data on different jobs held by graduates and indicates that 61 percent held but one job; 30 percent had two jobs; while 9 percent held three jobs. Of the 1241 graduates studied, 88 percent or 1091 were employed at least once since graduation.

TABLE 8
NUMBER OF DIFFERENT JOBS SINCE GRADUATION

CATEGORY	MALES N = 362	FEMALES N = 728	TOTAL GROUP N = 1090
One job since graduation	68%	58%	61%
Two jobs since graduation	24%	33%	30%
Three jobs since graduation	8%	9%	9%
	100%	100%	100%

Did Graduates Experience
Formal Advancement Since Graduation?

As summarized in Table 9, about one-fourth of Area Vocational-Technical School graduates received a formal advancement during the first year on the job. In light of the assumption that new workers on the job would not be likely to advance very rapidly during the first year, the fact that 23 percent did advance seems quite satisfactory.

TABLE 9
FORMAL ADVANCEMENT
DURING FIRST YEAR AFTER GRADUATION

CATEGORY	MALES N = 333	FEMALES N = 701	TOTAL GROUP N = 1034
Yes	26%	22%	23%
No	74%	78%	77%
	100%	100%	100%

Would Graduates Choose the Same Training Program
If They Could Start Again?

This question was asked of graduates in an attempt to learn, one year after graduation, of students' satisfaction with the training they had taken. Table 10 records a high degree of satisfaction, although there is no data available on why one-fifth would choose another type of preparation.

TABLE 10
WOULD CHOOSE SAME PROGRAM AGAIN

CATEGORY	MALES N = 370	FEMALES N = 717	TOTAL GROUP N = 1087
Yes	79%	79%	79%
No	21%	21%	21%
	100%	100%	100%

The data summarized in these preliminary studies of graduates indicates that the Minnesota Area Vocational-Technical Schools are doing an excellent job of preparing people, who not only become employed initially, but persist on the job.

If one removes those graduates who enter the military or who take additional training and therefore are not available for employment, 83 percent of the women and 95 percent of the men do become employed. This finding speaks highly for the preparatory programs conducted in the Area Vocational-Technical Schools of Minnesota.

FINAL ANALYSES OF DATA

In the foreword at the beginning of this Final Report, the writer explained that there are two kinds of reports dealing with the analysis of data accumulated throughout the conduct of Project MINI-SCORE.

The present Final Report provides a general over-view of the entire study from initiation to conclusion, with reports of significant findings, conclusions, and associated outcomes. Paralleling and supporting this document are five technical reports appropriately titled Project MINI-SCORE Final Technical Reports. (See back page of this report for all titles.)

Thus, a person who simply wants to read a general description of the research would do so by referring to the present report; a researcher or other person so inclined who wished to probe deeper into the differentiative or predictive power of the various standardized instruments, the derivation or development of training success or employment success norms based upon these same instruments would additionally turn to the applicable technical document.

The Principal Investigator who carried responsibility for preparing this Final Report and the Project Director who authored much of the Technical Reports believed this separation in reporting would increase the usefulness of all sets of documents. Therefore in the materials which follow, the reporting of data analysis will be for the most part general, although based upon and in complete agreement with the Technical Reports.

Likewise, the over-riding objective of the MINI-SCORE Project was to ferret out data useful to guidance personnel in the process of counseling students in the Minnesota Area Vocational-Technical Schools. As a result, most of the data analysis has produced information of immediate use to counselors. This fact will become evident throughout the summaries which follow.

The Ability of Standardized Test Instruments to Predict The Various Criteria of Vocational Student Success

Since the beginning of this century and more specifically with the early work of Frank Parsons, the need for counseling aids to assist individuals in making occupational choices has been a paramount concern. Two basic problems faced Parsons; the same problems perplex and challenge present-day counselors in their efforts to assist students.

Students must have adequate information about their similarities to successful people in occupations which they might wish to enter, and they also need information concerning their chances of success if they pursue a particular occupation. Counseling aids which are developed to help solve the first problem generally concentrate on assisting individuals with determining group membership. Counseling aids developed to help solve the second problem tend to concentrate on predicting success in the occupation.

Project MINI-SCORE has addressed its attention to both problems; these are reviewed in the present discussion and analysis of data (prediction) and in the second major discussion (membership), which follows.

Objectives of These Analyses

1. To determine the ability of each instrument utilized in Project MINI-SCORE to predict the various criteria of vocational training success.
2. To determine the relative ability of each of the different instruments to predict each criterion of vocational student success.
3. To determine which sub-set of specific scales from the total Project MINI-SCORE battery, and which sub-set of personal student data variables most effectively predict each of the different measures of success.

Criteria of Vocational Student Success

1. Graduation versus dropping out of the program.
2. Being employed in a job related to training versus being unemployed or being employed in a job unrelated to training one year after graduation.
3. Being employed in a job related to training one year after graduation versus dropping out of the program.
- 4 - 6. Job satisfaction as measured by the three scales of the MSQ (intrinsic, extrinsic, and general satisfaction).
- 7 - 11. Job satisfactoriness as measured by the five scales of the MSS (promotability, personal adjustment, conformance, dependability, and general satisfactoriness).

Population Studied

The population of Minnesota post-high school area vocational-technical school students included in these analyses represented nine separate groups. Six of the groups represented three "primarily" male and three "primarily" female occupational curricula. The other three groups represented the total Project population, the total population of males, and the total population of females. Multiple and zero-order correlation analyses were performed on each population, taking scores obtained from students upon application to the schools (instruments used were the GATB, MVII, 16PF, MIQ, VDI, MSAT, and a personal data sheet) and correlating them with each of eleven different criteria of vocational student success.

Table 11 presents a listing of each of the groups derived from each of the populations and the number of observations in each group. The number of people included in a given analysis group was the same for the analysis of each of the instruments included in the Project MINI-SCORE battery except the MSAT. The

Minnesota Scholastic Aptitude Test scores were not available on all members; therefore, analyses which included the MSAT score were performed on only those individuals who had MSAT scores. Care must be taken when interpreting the analyses related to the MSAT, since people who had taken the MSAT were systematically different from those who had not. In order to have an MSAT score most applicants would have had to have been high school juniors in Minnesota since 1955. This means that people who attended high school before that time or who were drop-outs prior to their junior year would not have had MSAT scores. Two sets of numbers are presented in Table 11. The numbers of observations included in all of the analyses except the MSAT analyses are not in parentheses, while the numbers of observations included in the MSAT analyses are in parentheses.

TABLE 11
NUMBER OF STUDENTS IN EACH OF THE ANALYSIS GROUPS
FOR EACH OF THE NINE POPULATIONS

Populations	Grad vs Drop	Empl Rel- Other	Empl Rel- Drop	Satis- faction	Satisfac- toriness
1. Automotive	770 (577)*	202 (172)	405 (304)	103 (86)	103 (86)
2. Power and Home Electricity	263 (220)	99 (80)	143 (124)	73 (64)	73 (64)
3. Welding	325 (243)	99 (75)	122 (90)	41 (31)	41 (31)
4. Clerical	703 (534)	422 (330)	483 (385)	292 (238)	292 (238)
5. Practical Nursing	541 (386)	356 (266)	366 (267)	309 (234)	309 (234)
6. Secretarial	848 (641)	564 (447)	589 (468)	437 (348)	437 (348)
7. Total of all students from all curriculums in the cooperating schools during the study period who had complete test data	7637(5780)	3204(2533)	4345(3374)	2087(1668)	2087(1668)
8. All males in the total population	4561(3484)	1362(1085)	2327(1809)	772 (630)	772 (630)
9. All females in the total population	3076(2296)	1842(1448)	2018(1565)	1315(1038)	1313(1038)

*Number in parentheses includes only students who had MSAT scores.

Findings From Analyses

Objective 1: To determine the ability of each instrument to predict the various criteria of vocational training success.

1. There appeared to be no consistent pattern among the three male curriculum groups or among the three female curricula in terms of the measures that predict the criteria. Different measures appear to be predictive of the various criterion measures of success for each of the male groups and for each of the female groups; overall, this resulted in no consistent pattern.
2. Little consistency was found between the scales that most effectively predicted the various criteria within each of the three populations (total male population, total female population, and total population).
3. Some of the multiple correlations were statistically significant, but their practical significance should be questioned.

None of the correlations accounted for ten percent of the variability in the criterion, and only three accounted for five percent of the variability. Thus, the reader or researcher must decide for himself what he considers to be a practically significant correlation for his purposes.

Summary

The results indicate that it is not possible to generalize in terms of the ability of an instrument to predict a given criterion. Table 12 summarizes the criteria most highly correlated with an instrument in each of the three total populations. In no case did an instrument correlate most highly with the same criterion for each of the three total populations. This tends to indicate that the predictive power of an instrument relative to a given criterion of vocational student success changes from population to population.

TABLE 12

CRITERION MOST HIGHLY CORRELATED WITH
A GIVEN INSTRUMENT IN EACH OF THE THREE POPULATIONS

INSTRUMENTS	TOTAL POPULATION	TOTAL MALE POPULATION	TOTAL FEMALE POPULATION
GATB	Employed Related vs Drop	MSS - Promotability Competence	Employed Related vs Drop
MVII	Employed Related vs Drop	MSS - Promotability Competence	Employed Related vs Drop
16PF	Employed Related vs Drop	MSQ - Extrinsic Satisfaction	MSQ - Extrinsic Satisfaction
MIQ	Employed Related vs Drop	Employed Related vs Other	MSQ - Intrinsic Satisfaction
VDI	Employed Related vs Drop	Employed Related vs Other and MSS - General Satisfactoriness	Employed Related vs Drop
Personal Data	Employed Related vs Drop	Employed Related vs Drop	MSS - Conformance
MSAT	MSS - Promotability Competence	None Significant	MSS - Promotability Competence

Objective 2: To determine the relative ability of the different instruments to predict each criterion of success.

1. No one test utilized in Project MINI-SCORE is the most effective predictor of all of the criteria.
2. Three instruments emerged as most useful in attempting to predict success of vocational students. These are:
 - (a) the Minnesota Vocational Interest Inventory
 - (b) the Sixteen Personality Factor Questionnaire
 - (c) the Minnesota Importance Questionnaire

These instruments in the order above measure factors related to interests, personality and needs of an individual.

3. Perhaps, then, the most important finding from these analyses suggests that counselors must give careful attention to student interests, personality, and needs, since these have been found to be more strongly related to success.

Table 13 which follows charts the various instruments against criteria and shows those most highly correlated for the three populations.

TABLE 13
INSTRUMENT MOST HIGHLY CORRELATED WITH EACH CRITERION
FOR THE THREE TOTAL POPULATIONS

CRITERIA	TOTAL POPULATION	TOTAL MALE POPULATION	TOTAL FEMALE POPULATION
Grad vs Drop	Personal Data, MVII, 16PF	16PF	MIQ
Employed Related vs Other	Personal Data	MIQ	MIQ
Employed Related vs Drop	Personal Data	MIQ	MIQ
MSQ-Intrinsic Satisfaction	MIQ	GATB	MIQ
MSQ-Extrinsic Satisfaction	16PF	16PF	16PF
MSQ-General Satisfaction	16PF, MIQ	MVII	16PF
MSS-Promotability, Competence	MIQ	MVII	GATB, MVII
MSS-Personal Adjustment	MVII	VDI	None Significant
MSS-Conformance	MIQ	MVII	MVII
MSS-Dependability	MIQ	VDI	None Significant
MSS-General Satisfactoriness	MIQ	MVII	MVII

Objective 3: To determine which sub-set of specific scales from the total Project MINI-SCORE battery, and which sub-set of personal student data variables most effectively predict each of the different measures of success.

1. Little agreement was found between the specific instrument scales that are most predictive of a given criterion of success in different populations.
2. Little agreement was found as to the scales which are most predictive of the different criteria of success within the same population.
3. No single instrument scale was consistently correlated with each of the criteria using the same population as revealed by step-wise regression analyses.
4. As a general, overall conclusion from the Project MINI-SCORE research, the use of standardized test instruments as devices for predicting success in an occupation should be questioned.

The relationships between them and eleven criteria of vocational student success have been found to be very low.

For a more detailed discussion of these analyses, the reader should read Project MINI-SCORE Final Technical Report entitled The Ability of Standardized Test Instruments to Predict Training Success and Employment Success, as listed on the back page of this document.

While this particular sub-study aimed at evaluating the ability of standardized tests to predict success has proven to be very discouraging, the next major discussion of findings dealing with group membership will be more encouraging.

The Ability of Standardized Test Instruments to Differentiate Membership in Different Vocational-Technical Curricula

This second major analysis of data originates from two Project MINI-SCORE sub-studies aimed at determining the extent to which pre-enrollment standardized test instrument data are capable of providing meaningful information which can be used to differentiate people who are later successful in different occupations.

The investigations were conducted using two different definitions of vocational student success. The first was successful graduation and the second was successful graduation plus employment in a related occupation one year after graduation. The first sub-study investigated (1) the ability of each of the separate scales of each of the instruments to differentiate occupational groups and (2) the extent to which groups defined as successful graduates and groups defined as successful graduates who were employed in related occupations one year after training differed. The second sub-study investigated the ability of each total instrument to differentiate occupational groups and developed a method of presenting data pertaining to multi-scale test instruments in the form of a counseling aid.

Part One Analyses

The Ability of Each of the Instrument Scales to Differentiate
Membership in Different Vocational-Technical Curricula

Objectives of Part One Analyses:

1. To determine the ability of each of the scales of the six instruments in the test battery to differentiate among graduates of various curricula, and among graduates of various vocational-technical curricula who were employed in a job related to training one year after graduation, and
2. To determine whether the graduate population and the employed population did, in fact, differ significantly in terms of the separate test scales.

Curriculum Areas Analyzed:

The eighteen curricula selected for Part One were twelve predominantly male groups and six predominantly female groups which had at least twenty individuals in the employed related category.

These eighteen curriculum areas, as well as the number of graduates and the number of graduates employed in jobs related to training are shown in Table 14.

TABLE 14
CURRICULUM AREAS INVESTIGATED

CURRICULUM	NUMBER OF GRADS		NUMBER OF GRADS EMPLOYED IN A JOB RELATED TO TRAINING	
	Total	(with MSAT)	Total	(with MSAT)
<u>Predominantly Male Curriculums</u>				
Agri-Technology	115	(86)	23	(22)
Aircraft Mechanics	103	(69)	31	(15)
Automotive	495	(381)	130	(108)
Carpentry	181	(148)	64	(59)
Diesel Mechanics	69	(48)	20	(16)
Electronics	202	(159)	51	(40)
Farm Equipment Mechanics	72	(66)	23	(22)
Machine Shop	166	(131)	68	(59)
Mechanical Drafting and Design	251	(204)	82	(72)
Optical Technology	35	(21)	25	(14)
Power and Home Electricity	207	(150)	87	(74)
Welding	254	(194)	51	(40)
<u>Predominantly Female Curriculum</u> s				
Clerical Training	551	(413)	331	(264)
Cosmetology	249	(183)	103	(85)
Dental Assistant	52	(38)	24	(17)
Medical Laboratory Assistant	49	(30)	36	(24)
Practical Nursing	509	(368)	334	(249)
Secretarial Training	739	(555)	480	(382)

Populations Studied:

The analyses included in both Part One and Part Two were conducted utilizing two populations labeled "graduate" and "employed related."

The graduate population included all students in eighteen selected curricula who (1) had applied to one of the twenty-four cooperating Area Vocational-Technical Schools during the testing period from September 1, 1966, to October 1, 1968; (2) had taken the Project test battery; and (3) had graduated from the curriculum in which they were enrolled before July, 1970.

The employed related category included those students from the graduate population who were employed on a job related to their training one year after graduation and who were followed up before July 15, 1970. The analyses were conducted separately based upon the sex of the individuals included in the different curricula because past analyses had indicated that the scores of people on the standardized tests included varied systematically with the sex of an individual.

Findings from Part One Analyses:

1. Some of the scales of each of the instruments indicated that differences do exist between people who are successful in the different occupations.
2. These differences exist both between graduates of different occupational training programs and between graduates who later go out on the job and who are successful in an occupation related to the program from which they graduated.
3. All scales of four of the instruments (MVII, MSAT, VDI, and GATB) were effective in differentiating both among the male groups and among the female groups when success was defined as employment in a related occupation. In all cases, differences were significant at least at the .05 level and in most analyses, the differences were significant at the .01 level.
4. Many scales of the 16PF and the MIQ also significantly differentiated among the male groups and among the female groups using both criteria of success. In all cases, more scales of the 16PF and MIQ were capable of significantly differentiating the female groups than were capable of differentiating the male groups.
5. And finally, using the scales included in the test battery, few differences were found between those people who were successful graduates and those who went on to become successful in a job related to training.

This last finding suggests that anyone attempting to develop normative data for counseling purposes, using graduate groups for the development of that data, would derive approximately the same level of precision of normative data as when using data on those who were employed in occupations related to training, one year after graduation.

Part Two Analyses

The Ability of Each of the Multi-Scale Instruments to Differentiate Membership in Different Vocational-Technical Curricula

Objectives of Part Two Analyses:

1. To investigate the ability of multi-scale instruments included in the Project test battery to individually discriminate among groups that attended vocational schools and graduated, as well as groups that graduated and were later successfully employed in occupations related to the programs from which they graduated.
2. To develop a method of reporting the findings that will be useful to counselors who are trying to assist individuals to select from among alternative occupational education programs.

Curriculum Areas Analyzed and Populations Studied:

This population of Minnesota post-high school Area Vocational-Technical School students was divided into three sub-parts. The first contained those people who had enrolled in curricula which included primarily males; the second contained those people who had enrolled in curricula which included primarily females; and the third contained those people who had enrolled in occupational curricula which included both males and females without a predominance of either sex. Part Two analyses utilized the same population of students as Part One but encompassed, in addition, three additional curricula (accounting, data processing, and sales) which included an approximately equal number of males and females.

Findings From Analyses:

1. In all analyses conducted, the results indicated highly significant differences between groups of individuals who were successful in different occupations based upon pre-enrollment test data, both among female groups and among male groups.
2. The largest differences were found when using the MVII.
3. Differences among female groups were more pronounced than differences among the male groups.
4. It is possible to cluster occupations based upon the characteristics of people who enter them. However, the occupational clusters derived through the use of standardized test data differ somewhat depending upon the constructs measured by an instrument.
5. Graduates and graduates who were employed in related occupations one year after training were more similar than different.
6. Discriminate function scores afford a powerful technique for uncovering potential differences between groups of people who are successful in different occupations through the use of standardized test instruments.

Summary

The findings reported in Parts One and Two are of great significance to counselors in dealing with students who wish to select from alternative programs which are available to them. The results found in these analyses make it possible to present a counselee with valuable guidance information to enable him or her to make a most efficacious choice in the light of personal capabilities and interests.

In light of the findings of these two studies, three different methods of presenting counseling information to students were developed. The first was a method using norm profiles which is presented in a series of norm booklets (see the back cover of this document for a list of these publications). The second was a graphic method based upon discriminant analysis which is described and presented in the Technical Report entitled The Ability of Standardized Test Instruments to Differentiate Membership in Different Vocational-Technical Curricula. (These first two methods can be used directly by counselors.) The third method requires a computer to implement. This methodology is termed the Centour methodology and its application as used in Project MINI-SCORE is described in an article entitled, "The Centour Methodology Applied to Vocational Student Counseling and Admissions," (see Journal of Industrial Teacher Education, Fall, 1969). This latter methodology was adopted and implemented by the State of Minnesota in the Minnesota State-Wide Vocational Testing Program. Complete details on the total system as it was implemented can be found in the School Counselors' Handbook of the Minnesota State-Wide Vocational Testing Program.

The General Aptitude Test Battery

The final research conducted on the GATB consisted of the preparation of counseling aids in the form of graduation success norms and employment success norms on all appropriate accumulated data. Project MINI-SCORE gathered data on sixty-three different occupational training program groups.

These sixty-three training programs were again clustered by personnel from the Vocational and Technical Education Division of the State Department of Education and personnel from the Department of Industrial Education at the University of Minnesota into relatively homogeneous regroupings.

As one might expect, the specific titles given to training programs in any given training group are different, but upon close examination, are relatively the same. Knowing this rather intimately, the above personnel were able to arrange these sixty-three into the clusters which are shown in the next Table. Appendix A in the Technical Report entitled General Aptitude Test Battery Training Success Norms and Employment Success Norms provides a listing of all titles and an explanation of how these were combined into the present clusters.

Training Success Norms Population and Occupational Clusters

The population on which the present training success norms are based consisted of data obtained on students who were accepted to and graduated from the full-time, day programs offered in the twenty-four cooperating post-high school Area Vocational-Technical Schools of Minnesota during the

period from September 1, 1966, through July 1, 1970. Aptitude score profiles were prepared only for those occupational groups for which at least forty-nine complete, individual sets of data were available. Technical Report entitled General Aptitude Test Battery Training Success Norms and Employment Success Norms carries the actual sample used in developing each norm profile in Appendix D of that report. The twenty-seven groups treated in this Final Report were separated into three clusters on the basis of sex for reasons explained earlier. These three clusters include:

CLUSTER I

PRIMARILY MALE CURRICULA

Agri-Technology
Aircraft Mechanics
Architectural Drafting
Automotive
Carpentry
Chefs and Cooks
Diesel Mechanics
Electronics
Farm Equipment Mechanics
Fluid Power Technology
Machine Shop
Mechanical Drafting and Design
Mechanical Refrigeration,
 Air Conditioning, and
 Appliance Repair
Plumbing and Sheet Metal
Power and Home Electricity
Printing and Graphic Arts
Welding

CLUSTER II

CURRICULA WITH BOTH MALES AND FEMALES

Accounting
Data Processing
Interior Design and Sales Assistant
Sales

CLUSTER III

PRIMARILY FEMALE CURRICULA

Clerical Training
Cosmetology
Dental Assistant
Medical Laboratory Assistant
Practical Nursing
Secretarial Training

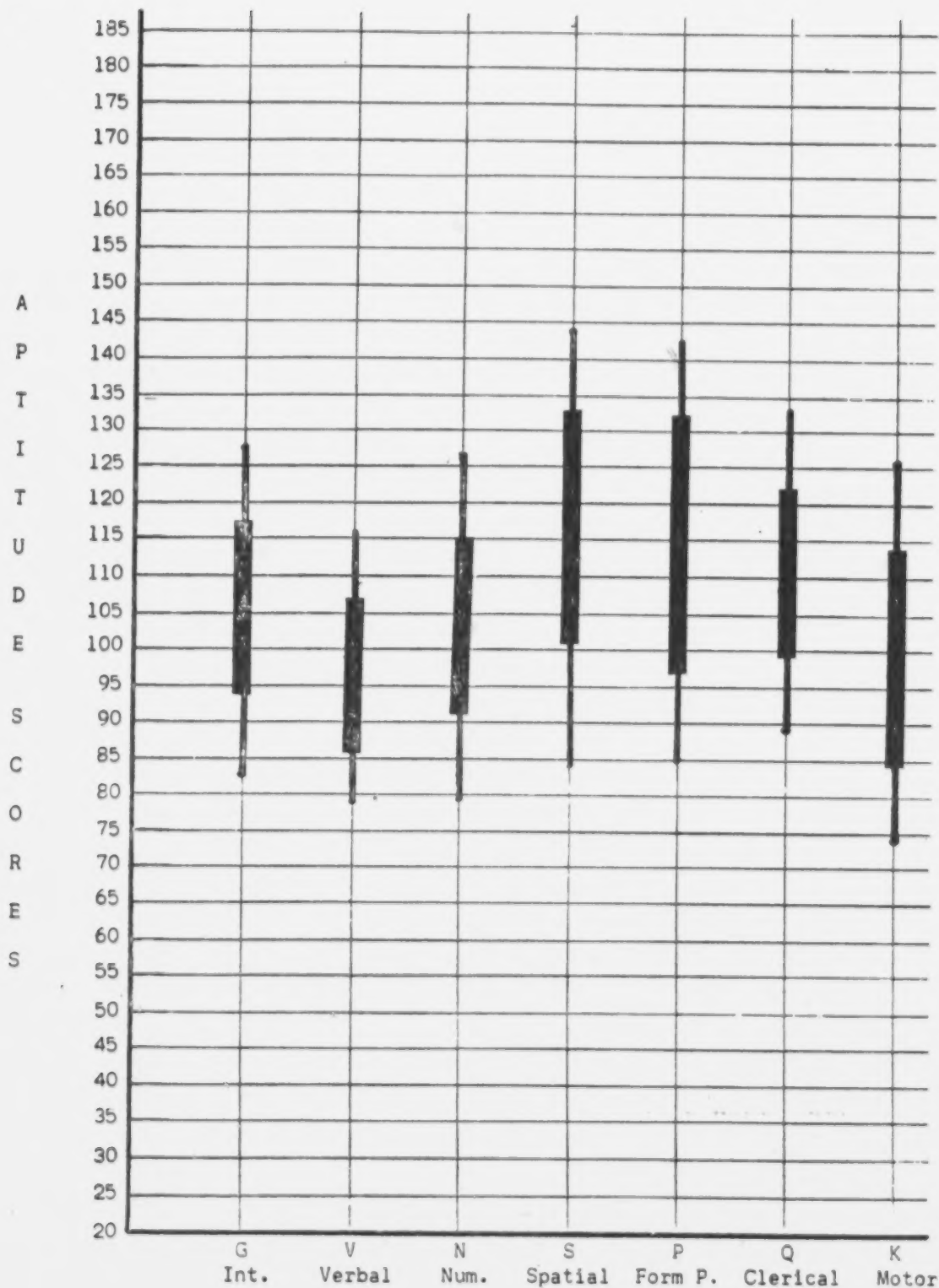
Employment Success Norms Population and Occupational Groups

The employment success norms were developed on a sub-set of the population used for training success norms described above. This population consisted of people who were accepted to and graduated from the full-time, day programs at the twenty-four cooperating schools, who were followed up on the job one year after training - between September 1, 1966, and July 15, 1970. Of the people who were followed up on the job, only those employed on jobs related to their training were included in the groups utilized in generating the employment success norms. Aptitude score profiles were prepared for all occupational groups for which at least fifty individual sets of data were available.

Employment success, or on-the-job success norms were developed for the thirteen occupational groups which were clustered on the basis of sex. These thirteen groups include the following:

TABLE 15
PROJECT MINI-SCORE TRAINING SUCCESS NORMS
GATB APTITUDE SCORE
PROFILE SHEET
AUTOMOTIVE

-56-



CLUSTER I

PRIMARILY MALE CURRICULA

Automotive
Carpentry
Electronics
Machine Shop
Mechanical Drafting and Design
Power and Home Electricity
Welding

CLUSTER II

CURRICULA WITH BOTH MALES AND FEMALES

Accounting
Data Processing

CLUSTER III

PRIMARILY FEMALE CURRICULA

Clerical Training
Cosmetology
Practical Nursing
Secretarial Training

Training Success and Employment Success Profiles

Counseling aids in the form of profiles for these three major groups were developed from the data. A sample of one Training Success Profile has been included here to illustrate how the data are shown in the Technical Report entitled General Aptitude Test Battery Training Success Norms and Employment Success Norms. In this document, all curriculum areas listed under the various clusters described in this report are represented with profiles.

Table 15 shows the sample automotive profile based upon GATB test data. The light-weight line represents the range in scores between the 5th and 95th percentiles; the top and bottom five percent were eliminated to avoid having to deal with extremely high or low scores. The bold center bar encompasses the middle two-thirds of the scores that were obtained most often by people who successfully completed a training program or who were successful on the job.

The middle two-thirds are identified by using the percentiles. The top of the bold bar is located at the 83.5 percentile, while the bottom of the bold bar is located at the 16.5 percentile. While all profiles in the Technical Report entitled General Aptitude Test Battery Training Success Norms and Employment Success Norms are in percentiles, that document also gives means and standard deviations for the reader who wishes to have this information.

Utilizing Profiles in Counseling

The GATB Technical Report provides all the necessary information, guides and related instructions for generating counseling aids and student profiles based upon GATB test data. That report contains profiles for all of the areas listed in the clusters discussed earlier. What remains is to develop a student profile which will then enable the student to make direct comparison of his profile with all other appropriate profiles. In so doing, the student compares his potentialities, as measured on the GATB, for occupational preparation directly with peer groups who have successfully completed training, or who were in addition performing successfully on the job one year following graduation.

This specific kind of counseling information which has heretofore been unavailable in this form should enhance the counseling process markedly.

The Minnesota Vocational Interest Inventory

Earlier in this Final Report, the Minnesota Vocational Interest Inventory was identified as one of the more effective instruments for counseling purposes with vocational students. The MVII was developed upon the assumption that people engaged in various occupations possessed likes and dislikes in common, and that these patterns differ from those possessed by workers in other occupations. In addition, follow-up research on interest patterns as identified on the MVII and similar instruments exhibit a high degree of stability over time.

Thus, MVII scores afford another potent counseling aid to assist students in comparing their interest patterns with those of peers who have completed training programs successfully, or in addition, have performed successfully on the job for which they were prepared, one year after graduation.

Training Success Norms Population and Occupational Groups

The training success norms discussed in this report were developed with data obtained from students who were accepted to and graduated from full-time, day programs offered in the twenty-four cooperating post-high school Area Vocational-Technical Schools of Minnesota during the period from September 1, 1966, until July 1, 1970. Profiles have been prepared only for those occupation groups for which at least forty-nine individual sets of data were available. The actual sample used in developing each norm profile may be examined in Appendix D of Technical Report titled Minnesota Vocational Interest Inventory Training Success Norms and Employment Success Norms.

The same occupational clusters developed for the discussion about the GATB were used in the present research on the MVII. These clusters are repeated again below.

CLUSTER I

PRIMARILY MALE CURRICULA

Agri-Technology
Aircraft Mechanics
Architectural Drafting
Automotive
Carpentry
Chefs and Cooks
Diesel Mechanics
Electronics
Farm Equipment Mechanics
Fluid Power Technology
Machine Shop
Mechanical Drafting and Design
Mechanical Refrigeration,
 Air Conditioning, and
 Appliance Repair
Plumbing and Sheet Metal
Power and Home Electricity
Printing and Graphic Arts
Welding

CLUSTER II

CURRICULA WITH BOTH MALE AND FEMALE

Accounting
Data Processing
Interior Design and Sales Assistant
Sales

CLUSTER III

PRIMARILY FEMALE CURRICULA

Clerical Training
Cosmetology
Dental Assistant
Medical Laboratory Assistant
Practical Nursing
Secretarial Training

Employment Success Norms Population and Occupational Groups

The employment success norms discussed in this report were developed on a sub-set of the population used to develop the training success norms. The population included people who were accepted to and graduated from the full-time, day programs of the twenty-four cooperating schools between September 1, 1966, and July 1, 1970, and who were followed up on the job one year after training - between September 1, 1966, and July 15, 1970. Of the people followed up on the job, only those who were employed in a job related to their training (based on the Project MINI-SCORE classification presented earlier) were included in the groups used to generate employment success norms. (The "employment success" norms in this report could also be called "on-the-job" norms.) Profiles have been prepared for all occupational groups for which at least fifty sets of data were available. The sample size of the groups used in developing the norms may be examined in Appendix E of the Technical Report entitled Minnesota Vocational Interest Inventory Training Success Norms and Employment Success Norms.

Description of the Profiles

The profiles represent standard scores for each of the homogeneous keys that were converted from raw scores using the conversion tables developed by the Psychological Corporation (Psychological Corporation, 1966). The means and standard deviations of the raw scores for each key for each of the occupational groups are presented in Appendices D and E in the Technical Report entitled Minnesota Vocational Interest Inventory Training Success Norms and Employment Success Norms, along with the number of people in each occupational group. Table 16 is an example of such a profile for the automotive group. The light-weight line represents the range between the 5th and 95th percentiles. The top and bottom five percents were eliminated to avoid having to consider extremely high or low scores. The bold bar represents the middle two-thirds of the scores that were obtained most often by people who successfully completed a training program or were successfully employed in related occupations. The top of the bar is located at the 83.5 percentile and the bottom of the bar is located at the 16.5 percentile. The percentiles were used in developing the profiles rather than the means and standard deviations because the percentiles are sensitive to skews in the distributions.

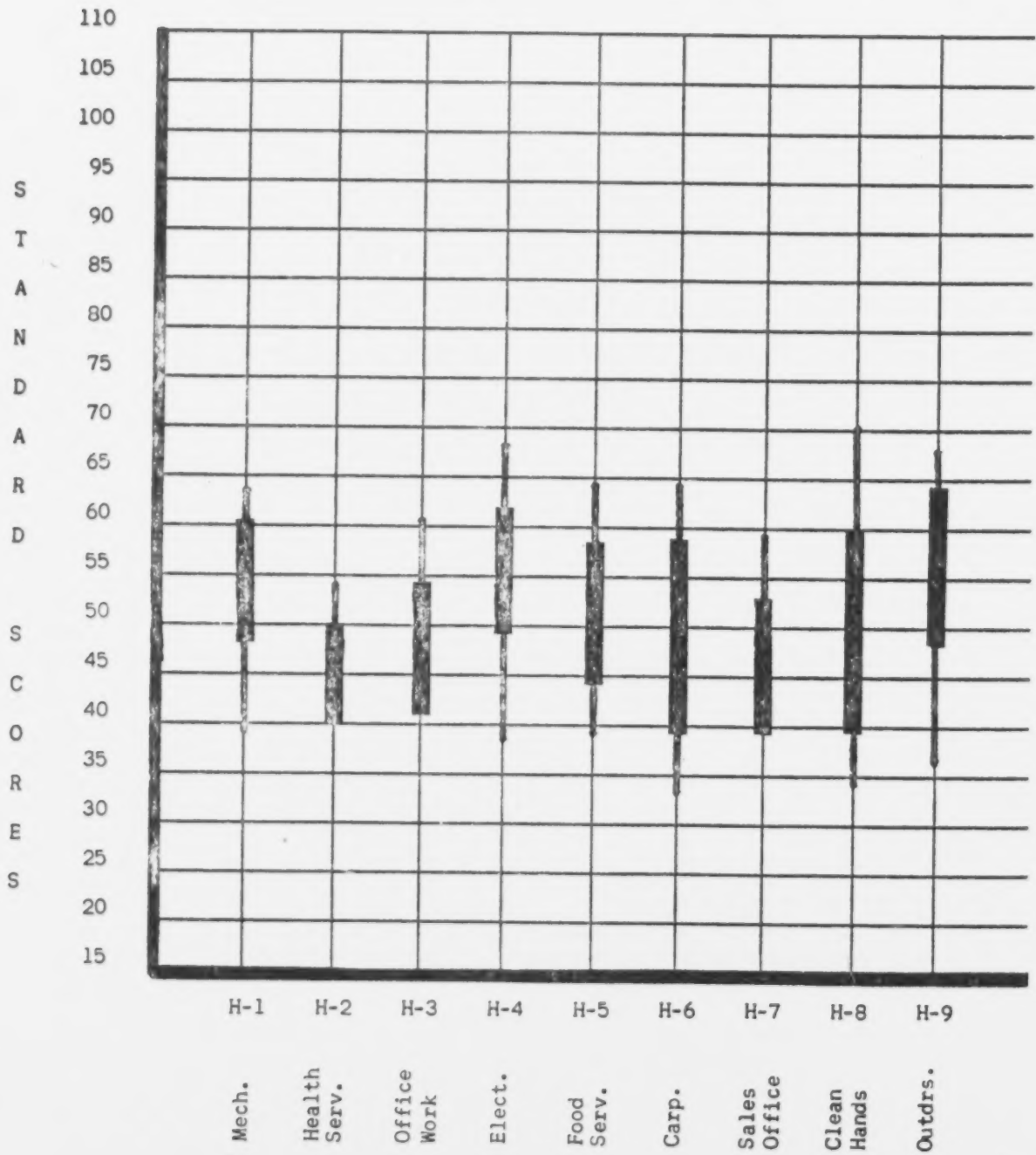
Utilizing Profiles in Counseling

The Technical Report entitled Minnesota Vocational Interest Inventory Training Success Norms and Employment Success Norms provides all necessary information, guides, and instructions to enable a counselor to generate counseling materials utilizing MVII data. It also provides profiles for all of the areas listed in the clusters given earlier in this discussion.

In order to implement the use of these profiles, a student profile must be developed from MVII data which then may be directly compared with the printed profiles. This comparison should be made under the guidance of a counselor, but students should do it. Without this guidance, the uninitiated person might assume that if he has interest patterns similar to a given occupational group, he would also possess the necessary competence to perform in that occupation; this assumption is, of course, erroneous.

In addition to the various norms which have been discussed to this point, norms are also available on the Vocational Development Inventory (VDI), as well as the Minnesota Scholastic Aptitude Test (MSAT) which complete the counseling aids series.

TABLE 16
PROJECT MINI-SCORE TRAINING SUCCESS NORMS
MVII - HOMOGENEOUS KEY
PROFILE SHEET
AUTOMOTIVE



SUMMARY OF FINDINGS

A. With Respect to Predicting Various Success Criteria:

1. The standardized test instruments incorporated in the Project MINI-SCORE test battery were not effective in predicting the various criteria of vocational training success such as graduation versus dropping out; being employed in training-related work versus being unemployed or working in a non-training-related job; or being employed in a training-related job one year after graduation versus dropping out. Likewise, the instrument scores failed to provide significant findings associated with job satisfaction and job satisfactoriness.
2. Most of the multiple correlations were statistically significant, but their practical significance should be questioned.
3. On the problem of predicting various success criteria, the results obtained would be classified as spotty. Different instruments were minimally predictive of the various criteria and when considering the whole test battery, the results were inconsistent.

B. With Respect to Single Instrument Effectiveness:

1. No single instrument proved to be most effective for predicting all of the criteria.
2. Three instruments emerged as most useful for predicting success for vocational students. These are:
 - a. The Minnesota Vocational Interest Inventory (MVII)
 - b. The Sixteen Personality Factor Questionnaire (16PF)
 - c. The Minnesota Importance Questionnaire (MIQ)

Since these three instruments in the order listed measure factors related to interests, personality, and needs of individuals, they may well constitute the major key to counseling of vocational students.

C. With Respect to Instrument Scales:

1. Little agreement was found between specific instrument scales that are most predictive of a given criterion of success in different populations.
2. No single instrument scale was consistently correlated with each of the criteria using the same population.
3. The use of standardized test instruments, at least those incorporated in the Project MINI-SCORE test battery, as devices for predicting success, should be questioned.

D. With Respect to Prediction of Occupational Membership:

1. Each of the scales of each of the instruments indicated that differences do exist between people who are successful in the different occupations.
2. These differences exist both between graduates of different occupational training programs and between graduates who later go out on the job and who are successful in an occupation related to the program from which they graduated.
3. All scales of four of the instruments (MVII, MSAT, VDI, and GATB) were effective in differentiating both among the male groups and among the female groups when success was defined as successful graduation as well as when success was defined as employment in a related occupation.
4. In all cases, differences were significant at least at the .05 level and in most analyses, the differences were significant at the .01 level.
5. Many scales of the 16PF and the MIQ are also significantly differentiated among the male groups and among the female groups using both criteria of success.
6. In all cases, many more scales of the 16PF and MIQ were capable of significantly differentiating the female groups than were capable of differentiating the male groups.
7. Few differences were found between those who were successful graduates and those who went on to become successful in jobs related to training.

E. With Respect to Each Instrument's Ability to Differentiate Membership:

1. In all analyses conducted, the results indicated highly significant differences between groups of individuals who were successful in different occupations based upon pre-enrollment test data, both among female and male groups.
2. The greatest differences were found when using the MVII.
3. Differences among female groups were more pronounced than differences among male groups.
4. Occupations can be clustered by employing the characteristics of the people who enter them.
5. The total population of graduates and the population of those graduates who were employed in training-related occupations one year after training are more alike than different.

Discussion

Over seventeen thousand complete sets of data were accumulated utilizing the test battery employed in Project MINI-SCORE. This data base constitutes one of the most unique resources of information of its kind because all students tested were applicants to the Area Vocational-Technical Schools of Minnesota; many of these applicants became full-time students, and later, the graduates of various programs. There are other data bases, but very few which are unique in the sense that they are composed of all vocational-school-bound students. For counselors of these students, there may be no better resource extant today.

Enormous amounts of data were gathered and every single element has been translated into information usable by counselors and students for decision-making purposes. In particular, the numerous profiles built from these data provide excellent counseling aids having immediate usage with a broad range of students and occupations.

Perhaps this realization more than any other factor impelled personnel associated with the Minnesota State-Wide Testing Service to inaugurate a Vocational Testing Program employing several of the better instruments used throughout Project MINI-SCORE. This means that juniors in high school may take these tests, making it possible to use the information for counseling purposes during the senior year of high school.

Thus, Project MINI-SCORE will not terminate with the Final Report, but will continue to function throughout Minnesota schools with the single objective of strengthening the counseling process among students who express occupational aspirations.

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VOLUMES OF PROJECT-MINI SCORE* FINAL REPORT

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PROJECT MINI-SCORE FINAL TECHNICAL REPORTS:

- Report One - The Ability of Standardized Test Instruments
to Predict Training Success and Employment Success
- Report Two - The Ability of Standardized Test Instruments to
Differentiate Membership in Different
Vocational-Technical Curricula
- Report Three - General Aptitude Test Battery
Training Success Norms and Employment Success Norms
- Report Four - Minnesota Vocational Interest Inventory
Training Success Norms and Employment Success Norms
- Report Five - Minnesota Scholastic Aptitude Test and
Vocational Development Inventory
Training Success Norms and Employment Success Norms

*The project was commonly known as Project MINI-SCORE (Minnesota Student Characteristics and Occupational Related Education) but was originally proposed with the formal title: Characteristics of Full-Time Students in Post-Secondary Trade Courses; U.S.O.E. project number HRD 5-0148.